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# PROCEEDINGS

OF THE

# AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXIII. DECEMBER, 1886. No. 124.

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# EXTRACT FROM THE BY-LAWS.

## CHAPTER XII.

### OF THE MAGELLANIC FUND.

SECTION 1. John Hyacinth de Magellan, in London, having in the year 1786 offered to the Society, as a donation, the sum of two hundred guineas, to be by them vested in a secure and permanent fund, to the end that the interest arising therefrom should be annually disposed of in premiums, to be adjudged by them to the author of the best discovery, or most useful invention, relating to Navigation, Astronomy, or Natural Philosophy (mere natural history only excepted); and the Society having accepted of the above donation, they hereby publish the conditions, prescribed by the donor and agreed to by the Society, upon which the said annual premiums will be awarded.

### CONDITIONS OF THE MAGELLANIC PREMIUM.

1. The candidate shall send his discovery, invention or improvement, addressed to the President, or one of the Vice-Presidents of the Society, free of postage or other charges; and shall distinguish his performance by some motto, device, or other signature, at his pleasure. Together with his discovery, invention, or improvement, he shall also send a sealed letter containing the same motto, device, or signature, and subscribed with the real name and place of residence of the author.

2. Persons of any nation, sect or denomination whatever, shall be admitted as candidates for this premium.

3. No discovery, invention or improvement shall be entitled to this premium, which hath been already published, or for which the author hath been publicly rewarded elsewhere.

4. The candidate shall communicate his discovery, invention or improvement, either in the English, French, German, or Latin language.

5. All such communications shall be publicly read or exhibited to the Society at some stated meeting, not less than one month previous to the day of adjudication, and shall at all times be open to the inspection of such members as shall desire it. But no member shall carry home with

ERRATUM.

Page 456, line 22, for *just* read *first*.

PROCEEDINGS

OF THE

AMERICAN PHILOSOPHICAL SOCIETY,

HELD AT PHILADELPHIA, FOR PROMOTING USEFUL KNOWLEDGE.

VOL. XXIII. DECEMBER, 1886. No. 124.

## *The Trigeminus Nerve in the Domestic Cat (Felis domestica).*

*By T. B. Stowell, Ph.D.*

*(Read before the American Philosophical Society, May 21, 1886.)*

The importance of the study of comparative neurology may be argued from the standpoint of anatomy, physiology, pathology and biology.

The value attached to such study depends largely upon individual bias, arising from education or from the end to be served by such knowledge.

Admitting that physiology may determine or suggest anatomical relations which otherwise would be obscure, it is none the less true that morphology must precede physiology; knowledge of structure forms the basis of knowledge of function. It may be added that human physiology, so called, is almost entirely comparative physiology; isolated experiments, independent of those performed upon animals exclusive of man, cannot establish law.

The influence of the nervous system upon function, and the complexity of physiological experimentation arising from this cause, are familiar to every laboratory student of this subject.

These considerations are a sufficient apology for the present "Study of Nervus Trigeminus" as a contribution to comparative neurology.

Reasons for the selection of the domestic cat have been stated elsewhere (Anatomical Technology, p. 55, v. Bibliography, **33**). The study of N. Vagus (The Vagus Nerve in the Domestic Cat, **27**) and the present study cannot fail to convince that in general plan, and even in detail of structure and distribution, the nervous system of the cat forms a desirable basis for comparative neurology, and possesses special advantages as a preliminary to anthropotomic neurology.

The writer is not aware that any one has published the details of the distribution of the trigeminus nerve in the domestic cat. He regrets that he has not been able to obtain Swan's work (**29**), in which are described the cranial nerves of the jaguar.

He cannot reconcile the wide discrepancy between the origin, distribu-

tion, etc., of this nerve in American cats, and the origin, etc., as published by Mivart (**18**, p. 271).

The ectal origin has been described by Wilder (**33**, **34**).

Most of this work was done in the anatomical laboratory of the Cornell University, where special facilities are afforded for original research.

**Preparation**: The cats were injected with the "starch injection mass" (Anatomical Technology, 2d ed., p. 140–141, **34**). Brains were dissected "recent" and "hardened in alcohol;" there are advantages peculiar to each for tracing the ultimate distribution of nerve-filaments. Dissections were verified from both kinds of specimens. For preliminary examination, it is suggested that the student begin at the foramina of exit and trace peripherad; this will avoid confusion in identification and the inadvertent severing of anastomotic filaments. A more thorough dissection can subsequently begin with any of the peripheral rami—*e. g.*, N. digastricus or N. auriculo-temporalis—and proceed centrad.

## NERVUS TRIGEMINUS.

**Synonymy**: *Nervus trigeminus; N. divisus seu gustatorius; N. quintus, seu tremellus, seu mixtus, seu sympatheticus medius, seu sympathicus medius, seu anonymous, seu innominatus; Par trigeminum seu quintum nervorum cerebralium, seu trium funiculorum; Trifacial; The fifth pair of nerves.*

This nerve presents the following characters, viz:

**General Characters**: The constancy of its characters and the striking resemblance, even of details, to the human trigeminus; the size—it is the largest of the cranial nerves; the analogy to the spinal nerves—the origin and the double function refer this nerve to that class of cranial nerves which admits of ready comparison with the spinal nerves (this homology is incomplete, by reason of the unequal distribution of the sensory and the motor filaments); the two roots, the larger is ganglionic, the smaller is without ganglion; these root functions are sensory and motor respectively.

To the ganglionic or sensory division is referred the sensibility of the face, cheek, forehead, external ear (auris ectalis), pili tactiles, vibrissæ, eye (conjunctiva), teeth, lips, mouth, nose, dorsum of tongue; the non-ganglionic or motor division is distributed chiefly to the muscles of mastication; to these functions may be added the influence of this nerve upon the glands (parotid, submaxillary, sublingual, lachrymal, buccal (?)), and its undetermined action upon the middle ear.

There are several ganglionic masses ectad of the cranium which sustain intimate relations with this nerve. Each of these ganglia seems to communicate with a motor, a sensory and a sympathic root or nerve, and thence to distribute filaments to structures more or less contiguous.

**Physiological Characters**:

1. Simple nerves of sensation.
2. Mixed or myelic nerves.

3. Nerves of common sensation with a specialized function and with motor filaments.

4. Nerves which directly or through their relation with N. sympathicus indirectly control or modify glandular secretion.

It is unsatisfactory to attempt to classify the function of N. tensor tympani and the filament to the tentorium cerebelli.

## DESCRIPTION.

**Origin:** The study of the entocranial portions of the trigeminus nerve includes the description of the ental (deep) and the ectal (apparent) origins of both portions.

The ental origin has not been satisfactorily determined. Preliminary work based upon Mondino's Golgi's perchloride of mercury method (Journal of Royal Microscopical Society, N. S. V., Part 5, p. 904, **16**) indicates a method for the solution of this difficult problem.

The method for tracing nerve-tracts in the brain and spinal cord as published in Brain, Vol. viii, p. 86, may prove serviceable in this connection.

The impracticability of positively establishing the relations of the two roots without serial transverse sections leaves the ental origin involved in obscurity; the following general relations, determined under a magnifying power of 15–20 diameters, may serve to indicate the wide-spread origin of this nerve, and also the necessity of making serial sections along a considerable portion of the neuron.

The fasciculi, by whose confluence the nerve-trunks are formed, may be designated the

**Proximate roots:** From morphological considerations alone it would be natural to treat this nerve as having two roots, the motor and the sensory.

*Radix motoria:* The motor root generally—not invariably—consists of two packets, the dorsal or cerebellar, and the ventral or epicœlian.

The fasciculi of the dorsal root often lie free of the pons, or they interdigitate with the pons; they may be traced along with medipeduncular fibres to the cerebellum; the motor root frequently contains fibres from the pons.

The larger or ventral root generally lies wholly free of the pons (some of its fibres may interdigitate with the pons). It forms the caudal border of the emarginate pons, and may be traced caudad of the prepeduncle to the floor of the epicœle, about 2 mm. laterad of the meson, at which point the fibres bend abruptly ventrad.

The two-fold origin of this root is suggestive of difference of function.

*Radix sensoria:* The sensory root seems to have a four-fold origin; these roots, by virtue of their course, may be named cephalic, dorsal, caudal and ventral roots respectively. *Rx. cephalica* may be traced with some radical fibres of the prepeduncle into the floor of the epicœle, and thence cephalad to the region of the preopticus.

Do not these fibres suggest an ental origin similar to the anthropotomic

origin demonstrated by Meynert (**28**, p. 732 *et seq.*) and by Spitzka (**26**, The Central Tubular Grey, p. 72).?

*Rx. dorsalis* is apposed to the medipeduncle, and is traceable with it into the cerebellum.

*Rx. caudalis* extends parallel with the meson to a region of the metencephal just entad of the olive.

This considerable fascicle points to an ental origin several mm. caudad of a transection through the caudal border of the pons, and in the region of the olive.

*Rx. ventralis:* The fourth radicule comes from the epicœle in the same region as the ventral root of Rx. motoria; its course is laterad, and lies caudad of the medipeduncle, and ventrad of the medipeduncle and prepeduncle.

**Ectal Origin**: There is some variation in the ectal origins of this nerve in different animals. This variation may be referred to the variation in general configuration of the brain, and does not prevent homologization.

"When the pons is less developed than in man, the nerve (trigeminus) is attached behind (caudad of) that part between it and the trapezium of the medulla oblongata" (**30**, Vol. ii, 270).

Wilder summarizes as follows: "In the cat the nerve is always nearer the caudal than the cephalic border of the pons." "Sometimes the entire nerve passes just caudad of the pons, which is then usually somewhat emarginate at that point." "Sometimes, perhaps more often, some of the fibres of the nerve interdigitate with those which form the caudal margin of the pons" (**33**).

As already indicated, the proximate roots by their confluence form two nerves with distinct ectal origins, but which are intimately related in their distribution.

*Radix motoria* (Rx. mtr.), the smaller of these nerves, lies upon the mesal border of Rx. sensoria. It is a slender ribbon-like packet composed of 6–9 funiculi; it sustains this general relation for about 5 mm.; near the cephalic border of the pons it crosses the ventral surface of a large flattened ganglion, G. gasseri, q. v., and finds its exit with N. mandibularis through the oval foramen. Its distribution is given with N. mandibularis.

*Radix sensoria* (Rx. sn.), the larger and ganglionic nerve, takes its ectal origin from the proximate roots which lie chiefly caudad of the pons. The caudal border of the nerve is not infrequently in a line with the caudal border of the pons, but this relation is occasioned by the emarginate border of the pons against which the nerve-trunk rests.

In the examination of the brains of *Felis leo* and *F. concolor* (one of each) and *F. domestica* (a large number), in the museum of Cornell University, I have not found a single instance in which any fibre of the pons passes wholly caudad of the trigeminus. Only a few of the fibres of the cephalic border of Rx. sensoria ever interdigitate with the pons, and this condition does not exist in the majority of brains examined. In some of the brains hardened in alcohol a few filaments from the pons seem to be

continuous with Rx. sensoria. In injected brains the sensory root is separated from the motor by an arteriole, a small twig from A. basilaris inferior.

In one instance a fascicle from the trapezium crossed the base of the trigeminus in such relation as to be easily mistaken for fibre from the pons The emargination of the pons may have led to a misconception of the freedom of origin of this root. In one case cited by Wilder (unpublished) a fascicle from the cephalic surface of the sensory root passed centrad near the middle of the pons.

**Summary—Ectal Origin**: 1. Fibres of the pons are found caudad of the lateral and cephalic moiety of the motor root.

2. Sometimes the motor root is entirely free of the pons.
3. The entire motor root never penetrates the pons.
4. The sensory root never penetrates the pons.

## GANGLION GASSERI.

**Synonymy**: *Ganglion gasseri; Ganglium gasseri; G. gasserianum; G. semilunare; Moles gangliformis; Intumescentia gangliformis seu semilunaris; Tænia nervosa Halleri; Ganglion of the fifth nerve*, etc.

**Description** (Fig. G.): At the cephalic border of the pons the sensory root is involved in a large flattened ganglion; this ganglion is lodged in the fossa upon the dorsal surface of the basi-sphenoid bone caudad of the foramen ovale, Fm. rotundum and Fm. lacerum anterius; the lateral angle is covered by the ventral wing of the osseous tentorium; the tentorium cerebelli is intimately related with the dorsum of G. gasseri, and is with difficulty separated from it. The ganglion is a flattened, irregular body 8 mm. long by 4 mm. wide; the cephalic border is trichotomous, and gives origin to the principal rami of the sensory root; the mesal border is nearly straight, and is in contact with the processus clinoideus; the lateral border is crescentic, and is characterized by a peculiar enlargement at its caudal extremity; this eminence is the origin of the first rami of the trigeminus; one ramus (Pe) enters the hiatus Fallopii, and gives origin to several funiculi, by which it is related with the facial nerve through three canals in the petrous portion of the temporal bone, and also with the glosso-pharyngeal and vagus nerves (through foramen jugulare). From the lateral angle of the eminence a filament (Tn) is given to the tentorium cerebelli; it lies apposed to the petrosal ramus ectad of the facial nerve.*

Upon its ventral surface G. gasseri is in relation with the motor root, and also with the large petrosal nerve which proceeds from the geniculate ganglion (this nerve follows the aqueductus fallopii, emerges from the hiatus fallopii, crosses G. gasseri and joins the vidian nerve just centrad of the vidian canal).

* This can be best demonstrated by exposing the base of the brain, by the removal of the basioccipital and basisphenoid bones, and then with nippers and arthrotome (34, pp. 63. 66), gradually removing the petrous portion of the temporal bone. This will expose the tortuous canal with the included nerves.

The mesal border of G. gasseri is contiguous with the oculomotorius (iii) upon its venter, and with the trochlearis (iv) upon the dorsum. The cephalic border is involved more or less in a dense rete arteriale from A. carotidea externa, and receives filaments from the adjacent plexus sympathicus carotideus.

## ECTOCRANIAL RAMI.

Ectad of the cranium the trigeminus is represented by three nerve-trunks and their respective rami. These trunks may be regarded as offsets of the Gasserian ganglion; they leave the cranium by distinct foramina. By virtue of distribution, they are named N. mandibularis, N. maxillaris and N. ophthalmicus. (Fig. Man. Mx. Oph.)

## NERVUS MANDIBULARIS.

**Synonymy**: *N. mandibularis; Inferior maxillary branch; Mandibular nerve.*

**General Characters**: This is the lateral ramus of the trigeminus; it is also the largest and widest in distribution. The motor root (Rx. motoria) is given exclusively to this trunk just pheripherad of the Gasserian ganglion—hence its varied character and two-fold function. It supplies sensory and motor structures and glandular organs. Its rami are distributed to the integument of the ear, the cheek and the chin; to the vibrissæ, the labial papillæ, the teeth and gums of the mandible, the sensory organs upon the dorsum of the tongue; to the muscles of mastication and to the salivary glands.

**Special Description**: N. mandibularis is the lateral offset of the Gasserian ganglion; just peripherad of the ganglion it is joined by the motor root (Rx. mtr.) of the trigeminus; peripherad of this union the motor and the sensory fibres require physiological rather than morphological identification; its foramen of exit is the foramen ovale; peripherad of the cranium the trunk divides into six or more rami, which require separate descriptions:

**N. temporo-auricularis**: *Superficial temporal; temporal cutaneous.*

**Origin**: This nerve takes its ectal origin at the foramen ovale; it is the lateral ramus of the nerve-trunk. (Fig. Tmp. aur.)

**Course**: It is first directed ventro-laterad, entad of the muscles and the A. carotidea externa; it lies close to the zygomatic process; at the ventrad border of the process it bends dorsad over the process, and lies caudad of the A. temporalis externa and entad of the submaxillary and the parotid glands. The general course is toward the cephalic border of the external ear (auris ectalis). Entad of the parotid gland it divides into two principal rami, which, by reason of general direction, are designated cephalic and caudal.

**Communicating Rami and Relations**: Just caudad of the zygomatic process this trunk gives a small twig to the mandibular articulation; it sustains relations with the otic ganglion by a slender fascicle which may

be regarded as the root, or one of the roots, of the ganglion; it also joins the facial nerve, and gives filaments to the base of the ear (cartilago auditorius). Dorsad of the meatus auditorius the auriculo-temporal nerve lies entad of the parotid gland; in this region its course is entad of the facial nerve, with which nerve it assumes plexiform relations (Fig. Tmp. Fac.). A. temporalis lies between N. tmp. aur. and N. tmp. fac.; ramuli (N. N. parotidei) enter the substance of the gland (Gl. par.). Near the middle of the gland the auriculo-temporal nerve divides into cephalic and caudal rami (Fig.).

**N. tmp. aur. cephalicus** becomes a distinct nerve at the cephalo-dorsal angle of the parotid gland. Its course is toward the eye until it reaches the zygomatic border of the masseter muscle, when it follows the border of the muscle to the angle of the mouth. It anastomoses freely with N. temporo-facialis (Fig. Tmp. fac.), which lies upon the ectal surface of the masseter muscle just dorsad of the Stenon's duct, and terminates in the plexus at the angle of the mouth, plexus labialis (Pl. lab.). It sends filaments to the integument between the eye and the base of the ear (auris ectalis), to the cheek ventrad of the eye, to the vibrissæ, the dorsal lip, and to the papillæ on the ental surface of the lip and to the mucosa in the region of the premolar teeth (Fig. p. m.).

**N. tmp. aur. caudalis** is distributed chiefly to the external ear; it may be traced with the terminal arterioles of A. temporalis, along the cephalic border of the ear; terminal filaments are given to the long hairs which line the helix (Fig. Pili); a considerable ramulus enters the meatus near the tragus (tr.), and descending centrad supplies the external meatus; other filaments are distributed to the frontal region. A small twig from the caudal border of this ramus just peripherad of the bifurcation of N. tmp. aur. anastomoses with the facial and terminates in the ventro-lateral border of the ectal ear and the hairs (Pili) between the lateral pocket and the tragus. This nerve does not appear to supply the dorsal surface of the external ear.

**N. massetericus** has its origin at the foramen ovale from the dorsum of the mandibular nerve (Fig. Mass.), in common with N. temporalis internus (Tmp. int.); 2 mm. peripherad of the common origin, this nerve becomes a distinct ramus; its course is dorsad for 8–10 mm., when it penetrates the masseter muscle and is directed to the caudal border of the malar muscle. Along its dorsal border it gives off 6–10 ramuli to terminate in the masseter muscle.

**N. temporalis internus**: The deep temporal has a common origin with the masseter, q. v. About 5 mm. peripherad of the origin an anastomotic filament connects these rami. The course of N. tmp. int. is dorsad and mesad of the temporal artery; it is therefore concealed by the artery when viewed from the side. About 8 mm. from its origin the ramus divides into cephalic and caudal ramuli (Fig.); these supply the fan-shaped temporal muscle; the length of the caudal ramulus is 45–50 mm.

**N. pterygoideus externus**: This small nerve has its origin from the

mesal border of the mandibular nerve (Fig. Pter. ext.): about 2 mm. from its origin it separates into three rami, which may be traced 8–10 mm. and then penetrate the pterygoid muscle, upon which muscle its terminal filaments ramify.

**N. buccalis** is a large nerve which separates from the mesal border of the mandibular nerve (Fig. Buccalis) just ventrad of the deep temporal The first 5 mm. of its course is involved in the dense rete of the carotid artery; its direction is toward the caudal angle of the maxilla; it is apposed to the buccal artery, and lies between the pterygoid and the temporal muscles. It gives filaments to the mucosa of the mouth (Fig.), a few filaments to the malar border of the masseter muscle, and at the angle of the mouth it joins the plexus already named—Plexus labialis (Pl. lab.).

**N. dentalis inferior** together with N. lingualis form the principal rami or continuation of the mandibular nerve. It becomes a distinct nerve about 5 mm. peripherad of the foramen ovale. It lies ectad of the pterygoid muscle, and enters the foramen infradentale with the mandibular artery. It lies along the dental canal ventrad of the artery, and gives filaments to the teeth (Fig. m., p. m., canine, incis.) and to the cancellous interior of the mandible; a considerable fascicle continues peripherad through the mental foramen (Fm. men.); the terminal filaments anastomose with filaments of its platetrope.

**N. mentalis** is the continuation of the dental nerve peripherad of the mental foramen; it divides into several fasciculi, which anastomose in plexiform relations upon the ventral lip, the chin and the mucosa of the mandible. (N. digastricus and N. mylo-hyoideus join this plexus.)

**N. mylo-hyoideus** is given from the mandibular nerve about 10 mm. centrad of the infra-dental foramen; its course is apposed to the facial artery; it lies entad of the artery as it crosses the mandible. Ventrad of the mandible it gives an anastomotic filament to the facial; it continues 1–2 mm. mesad of the submental artery, and, following its arterioles, is distributed to the mylo-hyoid muscle.

**N. digastricus** is a branch of the mylo-hyoid, or it may be regarded as a branch of the mandibular nerve peripherad of the point where the mylo-hyoid nerve lies ventrad of the mandible. About 3–4 mm. peripherad of this origin it divides into cephalic and caudal rami (Fig.). The *cephalic ramus* is apposed to the submental artery, supplies the distal half of the digastric muscle, and terminates in plexiform relations with the mental nerve; the *caudal ramus* follows the digastric artery caudad about 10 mm., and supplies the digastric muscle as far as the angle of the mandible.

**N. lingualis** has a common origin with the dental nerve; 5 mm. peripherad of the foramen ovale it takes a distinct course mesad of the dental nerve; it lies ectad of the pterygoid muscle, apposed to a small arteriole just entad of the carotid and the dental arteries; 15 mm. peripherad of its origin it takes three courses:

(1) The cephalic ramus, N. pharyngeus (Phar.), is distributed to the

pharyngeal mucosa and along the ental surface of the mandible to the symphysis.

(2) The middle ramus, the trunk proper, bends around the lateral border of the tongue, and enters its substance with the lingual artery 30 mm. proximad of the tip.

(3) The caudal ramus enters the lingual muscle with the lingual artery about 25 mm. caudad of the tip; this nerve seems to supply the muscle-fibre.

The middle and caudal rami assume plexiform relations; their numerous filaments generally accompany ramifying and anastomosing arterioles, and may be traced to the dorsum of the tongue; the caudal ramus sustains plexiform relations with the hypoglossal nerve. (XII.)

The lingual receives a considerable accession from the facial nerve, the chorda tympani (Fig. Chorda).

**N. submaxillaris**: Just mesad of the origin of the digastric artery this branch separates from the lingual nerve; it lies ectad of the artery apposed to Wharton's duct, which it freely supplies, and continues dorsad into the substance of the sublingual and submaxillary glands; it terminates in a small ganglionic mass, G. submaxillare (G. S. max.), near the origin of Wharton's duct. From this ganglion filaments may be traced to the substance of the gland.

**Chorda tympani**: This nerve is an anastomotic branch between the lingual and the facial. Its physiological action upon salivation, as well as its tortuous course, gives to it a special interest. It separates from the facial as this nerve emerges from the cranium at the ganglion geniculatum (intumescentia gangliformis); it returns a short distance in the canal of the nerve trunk, and enters a canal in the bulla; it penetrates the bulla, which it crosses dorsad, and enters the tympanum through a small foramen, iter chordæ posterius; it crosses the tympanum about the middle of the malleus, somewhat mesad of the bone, and emerges through a minute foramen, iter chordæ anterius, or the canal of Huguier, into the Glaserian (?) fossa, thence along the canal to the ectocranial foramen; as it emerges from the cranium it lies ventrad of the carotid and the pterygoid arteries and ectad of the pterygoid muscle; it joins the lingual nerve 5–10 mm. peripherad of the foramen ovale.

**N. pterygoideus internus** has a common origin with N. tensor tympani from the lateral border of the mandibular nerve just ventrad of the auriculo-temporal nerve (Fig. Pter. int.). It lies parallel with the lingual nerve for 5 mm.; it crosses the cephalic border of the external carotid artery, and accompanies the pterygoid artery; its course is entad of the chorda tympani, and supplies the distal portion of the pterygoid muscle.

**N. tensor tympani**: As the common nerve (V. supra) crosses the cephalic border of the carotid artery, N. tensor tympani (Fig. Ten. tym.) separates and bends around the ventral border of the artery, enters the otic ganglion, thence lies in the Glaserian fissure and terminates upon the

spherical tensor tympani muscle. This nerve does not seem to be incorporated with the ganglion.

**G. oticum**: *Otoganglium; G. auriculare; Auricular ganglion, Ganglion of Arnold*, etc. (Fig. Otic.)

Upon the tensor tympani nerve just dorsad of the carotid artery, at the hiatus fallopii, is a small pinkish ganglion, oval in outline, about 2 mm. in long diameter. It is related by anastomotic filaments with the sympathic plexus (Sym.) around the carotid artery; with the auriculo-temporal nerve by a twig dorsad of the carotid artery (Fig. root); the artery appears to pass between the two roots (?) of the nerve, the ganglion being at their confluence. Two slender fascicles from the otic ganglion enter the hiatus fallopii and join the facial nerve. (Fig. Pe.)

## NERVUS MAXILLARIS.

**General Description**: This is the middle ramus of the trigeminus; it is intermediate in size between the other rami; its course is immediately cephalad from the Gasserian ganglion through the foramen rotundum, the foramen of exit. The ectocranial trunk crosses the spheno-palatine space, lies along the infraorbital fossa, and penetrates the infraorbital foramen. In its course it is dorsad of the maxillary artery. The length of the trunk from the ganglion Gasseri to the foramen infra-orbitale is about 40 mm.

It supplies the integument of the forehead, cheek, dorsal lip, side of the nose; the vibrissæ, conjunctiva, lachrymal gland, maxillary teeth, palate, pharynx, and the membrane over the turbinated bones.

**Detailed Description and Rami**: N. maxillaris (Fig.), at the foramen of exit, is about 2 mm. in diameter; at its ganglionic origin, G. gasseri, it is somewhat intumescent; upon the ventral surface of this enlargement it receives a considerable filament from the large superficial petrosal of the facial. This anastomotic filament lies obliquely across the ventral surface of the Gasserian ganglion, and penetrates the rete carotideum to reach the nerve. The central 5 mm. of its ectocranial course is involved in a dense rete of the carotid artery and the carotid plexus, from which plexus it seems to receive filaments. The distribution of the nerve is given in the description of the rami.

**N. orbitalis** (Fig.) is the first ramus of the ectocranial trunk, and is given off at the foramen of exit; its course is dorsad, and extends about 2 mm., being involved throughout its course in the rete already described; it is the common origin of N. temporalis and N. malaris, q. v.

**N. temporalis** (Fig. Tmp.) is the caudal ramus of the orbital nerve; its general course is toward the post-orbicular process (processus post orbicularis); 2–5 mm. peripherad of its origin it divides into cephalic and caudal rami.

*R. cephalicus* (Fig. Tmp. ce.), the larger ramulus, passes ventrad of the post-orbicular process, and is distributed to the conjunctiva and integument of the dorsal lid, and to the lachrymal gland; it sustains anastomotic relations with the palpebral nerve.

*R. caudalis* (Fig. Tmp. ca.), a small ramulus, passes caudad of the process, bends caudad, and terminates in the integument over the forehead; it anastomoses with the auriculo-temporal nerve.

**N. malaris** is the lateral ramus of the orbital; its course is direct to the malar foramen (a small foramen in the malar bone just dorsad of the cephalic end of the zygomatic process); it penetrates this foramen, lies in a groove entad of the orbicular muscle, which it perforates near the angle of the eye, and is distributed to the ventral lid and cheek over the malar bone (this is the subcutaneous malar nerve of anthropotomy); its terminal filaments reach the labial plexus.

**N. palatinus cephalicus** (Fig. Plt. ce.): About the middle of the rete carotideum three rami are detached from the ventral surface of the maxillary nerve; these remain in the sheath for several mm. The cephalic ramus (Fig. Plt. ce.) lies ventrad of the palatine artery and enters the palatine foramen (the dorsal end of the posterior palatine canal); it sends an anastomotic filament to N. palatinus caudalis (Fig. Plt.). Just centrad of the palatine foramen (Fig. Fm. plt. p.) a large accession is received from the spheno-palatine ganglion (Sph.).

(In some cases a fascicle from this nerve enters a small foramen just caudad of the posterior palatine foramen, and, following a canal in the palatine bone, joins the nerve at the posterior palatine foramen). Peripherad of this foramen (Fm. plt. p.) the nerve lies close to the hard palate, and joins the naso-palatine nerve at the anterior palatine foramen (Fm. plt. a.); it sends numerous filaments to the rugæ upon the roof of the mouth and to the adjacent mucosa.

**G. spheno-palatinum** (Sph.). *Ganglion of Meckel:* This ganglion is located just caudad of the palatine and the spheno-palatine foramina; its cephalic angles or prolongations enter these foramina (Fig.): it is flesh-colored, 6 mm. × 2 mm., flattened, irregular in outline, the mesal border slightly concave; the lateral border is irregular by reason of the attachment of nerves; its roots are two large rami (N. N. sph. plt. Fig. root) of the maxillary nerve, which take origin just peripherad of the cephalic palatine nerve, and are included in the common sheath with that nerve for 2–4 mm.; the roots are inserted into the lateral angle of the ganglion about 1 mm. apart.

**Relations:** This ganglion (Sph.) is related with the maxillary nerve by two roots; with the carotid plexus (N. sympathicus) by two filaments (Sym.) from the caudal border between the roots and the vidian nerve; with the cephalic palatine by a large fascicle from the cephalo-lateral angle. It is the origin of the naso-palatine nerve (N. plt.) at the spheno-palatine foramen; the origin of N. pharyngeus near the vidian nerve; of N. palatinus caudalis at the lateral border caudad of the palatine foramen, and of N. vidianus at the meso-caudal angle.

**N. palatinus caudalis** (posterior): This nerve (Fig. Plt.) takes its origin from the lateral border of the spheno-palatine ganglion just centrad of the palatine foramen; its course is ventrad and caudad; 2–5 mm. from the

ganglion it divides into two ramuli, the shorter of which (Fig. cephalic) is distributed to the roof of the mouth caudad of the rugæ; the longer (Fig. caudal) bends caudad and supplies the soft palate to its caudal border; the caudal ramulus receives an anastomotic twig from N. palatinus cephalicus.

**N. pharyngeus**, a small nerve, has its origin from the spheno-palatine ganglion at the origin of the vidian nerve (possibly the nerve is an offset of N. vidianus); it supplies the pharyngeal mucosa (not shown in the diagram).

**N. naso-palatinus** is the principal offset of the spheno-palatine ganglion cephalad; it enters the spheno-palatine foramen (Fm. Sph.), lies upon the floor of the nares, passes ventrad through the anterior palatine foramen (Fm. plt. a.), and anastomoses with the cephalic palatine nerve (Plt. ce.). Numerous filaments from this nerve are traced in plexiform relation upon the membrane which covers the turbinated bones and the floor of the nares.

**N. N. dentales caudales**: Dorsad of the caudal angle of the maxillary bone a single filament is given off which penetrates the alveolus and supplies the molar tooth (Fig. m.); just cephalad, two considerable fasciculi (Dent. ca.) separate, lie along the infraorbital fossa, penetrate small foramina in the bone and terminate in the premolar teeth (Fig. p. m.); these dental nerves anastomose freely before they penetrate the bone, and also sustain a similar relation throughout the cancellous tissue of the alveoli; filaments of these ramuli join the cephalic dental nerve (dent. ce.).

**N. dentalis cephalicus**: Just caudad of the infraorbital foramen (Fig. Fm. inf. orb.) a considerable fascicle, N. dentalis cephalicus, penetrates the dental foramen (Fm. d.), together with an arteriole; it lies cephalomesad along a canal in the cancellous tissue of the maxillary bone, and gives nerve-supply to the canine tooth; it continues mesad until the terminal filaments anastomose with the nasal plexuses upon the turbinated bone in the region of the premaxilla. This nerve receives filaments from the caudal dental rami, and becomes considerably enlarged in the canal between the canine tooth and the foramen which leads to the prenares.

Is this enlargement the ganglion of Bochdalek? (Fig. B.)

**N. infra-orbitalis** is the continuation of the maxillary peripherad of the infra-orbital foramen (Inf. orb.). The nerve-trunk divides into a leash of terminal fasciculi.

**N. labialis** supplies the dorsal lip, the papillæ on its ental surface, the adjacent mucosa and the vibrissæ.

**N. nasalis** terminates upon the integument which covers the nasal cartilage.

**N. palpebralis** is distributed to the ventral lid and the conjunctiva as far mesad as the nasal duct.

**N. lachrymalis** takes a dorsal course around the orbit, and terminates in the lachrymal gland, where it anastomoses with the lachrymal nerve, an offset of the orbital (Tmp. ce.), q. v.

**N. Vidianus** is a ribbon-like offset of the meso-caudal angle of the spheno-palatine ganglion (Fig. Vidian); its course is caudad to the vidian canal. (The cephalic foramen of this canal is ventrad of the foramen lacerum anterius; the canal is 5–10 mm. in length. The caudal foramen opens upon the dorsum of the basi-sphenoid bone.) It lies along the canal, and at the caudal foramen the entocranial nerve lies ventrad of the Gasserian ganglion, and sends filaments to the eustachian tube, to the pharyngeal mucosa, and becomes N. petrosus superficialis major, which relates it to the facial nerve through a foramen in the petrous portion of the temporal bone.

At the cephalic end, near the spheno-palatine ganglion, two filaments are given to the ophthalmic nerve; the nerve is related with the maxillary through filaments which join the nerve-trunk just peripherad of the rete carotideum.

## NERVUS OPHTHALMICUS.

**General Description**: N. ophthalmicus (Fig. Oph.) is the mesal offset of the Gasserian ganglion; it is the smallest of the three nerve-trunks which proceed from the ganglion. The entocranial relations are with the trochlear nerve, which rests upon its dorsal surface (a tracer is required to separate the sheaths of these nerves); sometimes—not invariably—these nerves are related by anastomotic filaments with the oculo-motorius (III) along its ventral surface, and with the carotid artery by the rete carotideum which involves the nerve-trunk. The foramen of exit is the foramen lacerum anterius. The ectocranial relations are described in the distribution of the two rami, N. frontalis and N. oculo-nasalis. It is distributed to the integument of the forehead, dorsal lid, side and end of the nose, to the pili tactiles, to the conjunctiva, the lacus lachrymalis, and the membrane over the turbinated bones; to the trochlear and the ciliary muscles; to the lachrymal gland; to the dura mater. It communicates with the sympathic nerve. Its function is largely sensory.

**Special Description**: The central 5 mm. of the ecto-cranial trunk is involved in a dense rete carotideum; about 3 mm. peripherad of the foramen lacerum anterius the trunk divides into two rami, N. frontalis and N. oculo-nasalis.

**N. frontalis** is directed dorsi mesad, and bends around the caudal surface of the globe of the eye, lying ectad of the muscles; there are really two fasciculi in a common sheath; when upon the dorsi-meson of the globe the course is abruptly cephalad parallel with the meson to the musculus orbicularis palpebræ; before the nerve perforates the muscle, a considerable trunk, **N. supra trochlearis** (Fig. S-tro.), separates, and, following the supra-orbital ridge just entad of the fascia, it gives filaments to the dorsal lid, to the nasal duct, the angle of the eye (caruncula), and terminates upon the nasal integument; an anastomotic filament relates this ramus with the palpebral branch of the maxillary nerve. Peripherad of the point where N. frontalis pierces the orbicular muscle, it is known as

**N. supra orbitalis** (Fig. S-orb.). As this nerve crosses an arteriole 2–3 mm. peripherad of the muscle it divides into two terminal rami; the lateral ramus is directed laterad, and is given to the tactile hairs (Fig. Pili); the mesal ramus unites in plexiform relations with other rami over the forehead and the integument between the eyes. (I do not find a lachrymal branch to this nerve.)

**N. oculo-nasalis** (Fig. Nasalis) is the mesal ramus of the ophthalmic nerve; it is directed mesad upon the caudal surface of the globe; it lies entad of the rectus dorsalis muscle, ventrad of the ramus of the oculomotorius nerve (III.), which supplies the muscle, and dorsad of the optic nerve; it is apposed to the ophthalmic artery until it crosses the optic nerve; 8 mm. peripherad of origin at the lateral border of the rectus dorsalis muscle it sends 2–3 filaments (Rx. longa) 6 mm. long ventrocephalad to join the ciliary nerve (these nerves are probably the radix longa ganglii ciliaris of anthropotomy). Just laterad of the optic nerve a considerable fascicle crosses the ophthalmic artery and rests upon the dorsum of the optic nerve; this is **N. ciliaris longus**. It gives 3–5 filaments to the short ciliary nerve (cil. br.); about 2 mm. centrad of the globe the nerve divides into 5–8 small fascicles, which perforate the sclerotic coat and lie along the ental surface of this tunic (I have not satisfactorily demonstrated the termination). Opposite the mesal border of the optic nerve several filaments are given to the plexus carotideus (sympathicus, Fig. Sym.). The nerve-trunk, the caudal ethmoid (Eth. ca.), lies ectad of the mesal rectus muscle and entad of the trochlear; it enters the foramen ethmoideum caudale (Fm. eth. ca.) (posterius), accompanied by the arteria ethmoidea caudalis; entad of the foramen, filaments of the nerve are distributed (1) dorsad to the dura mater which covers the olfactory lobes (Olf.); (2) ventrad to the hypophysis (Hy.); (3) cephalad to the ethmo-turbinated bone (Tur.); (4) mesad to join the platetrope (Plat.) in the meson, while the ramus (Fig. externus) continues in a canal or groove in the frontal and nasal bones just laterad of the meson to the nasal cartilage (Ctl. nasalis), where it terminates in plexiform relations with other ramuli of the trigeminus and facial nerves.

**N. infra trochlearis**: Upon the dorsal border of the mesal rectus muscle the largest branch separates as the infra-trochlear nerve (Inf. tro.); this rests upon the ectal surface of the muscle entad of the trochlear muscle, and is directed cephalad to the border of the globe; 8–10 mm. peripherad of the origin this nerve gives off a filament which remains in the common sheath for some distance, and is distributed to the trochlear muscle (M. tro.) laterad of the "pulley;" the main nerve lies ventrad of the pulley, and is distributed to the conjunctiva (Cnj.) of the dorsal lid, the angle of the eye (lacus lachrymalis) and the side of the nose; it sustains plexiform relations with terminal filaments of the supra-trochlear nerve (S. tro.); centrad of the pulley a filament from the infra-trochlear nerve, together with the arteria ethmoidea cephalica (anterior), enters the cephalic ethmoid foramen (Fm. eth. ce.), and terminates upon the membrane over the turbinated bones.

## GANGLION OPHTHALMICUM.

**Synonymy:** *G. ophthalmicum; G. semilunare; G. ciliare.*

**Description:**-This small pinkish ganglion (Fig. G. oph.) is somewhat triangular in outline; just mesad of the lateral rectus muscle it rests by its base upon the ramus of the oculo-motorius nerve (III), which supplies the ventral oblique muscle, about 1 mm. peripherad of the origin of the ramus (this ramus does not seem to be incorporated in the ganglion). From the apex of the ganglion three filaments are sent cephalad to the globe; these lie ventrad of the optic nerve, and sustain plexiform relations with the long ciliary nerve (ciliaris) before they perforate the sclerotic tunic mesad of the optic nerve.

**N. ciliaris brevis:** The principal offset (Cil. br.) of the ophthalmic ganglion takes its origin from the apex of the ganglion and rests upon the lateral surface of the optic nerve; 3 mm. peripherad of the ganglion, at the point of contact with the optic nerve, it receives two filaments (radix longa) from the oculo-nasal nerve, and one or more filaments from the carotid (sympathic) plexus; along the side of the optic nerve it sustains anastomotic relations with the radix longa; 2–4 mm. centrad of the globe this nerve splits into 8–12 filaments, which perforate the sclerotic tunic around the optic nerve and lie along its ental surface (cf. N. ciliaris longus).

### SUMMARY.

*A.* Anatomical.

1. **Origin:** (*a*) Ental; not demonstrated.
   (*b*) Proximate roots; from the mesencephal, the cerebellum, the floor of the epicœle and the metencephal.
   (*c*) Ectal; *sensory root,* caudad of the pons; cephalic fibres sometimes interdigitate with the caudal fibres of the pons.
   *Motor root,* near the caudal border of the pons, sometimes wholly free of it.
2. **Foramina of exit:** Fm. ovale; Fm. rotundum; Fm. lacerum anterius.
3. **Ganglia:** (*a*) Entocranial, G. gasseri, just centrad of the foramina of exit; upon the sensory root.
   (*b*) Ectocranial, G. oticum, in the Gasserian fossa; G. submaxillaris, in the submaxillary gland, near the origin of the Wharton's duct; G. spheno-palatinum, just caudad of the foramen palatinum and a lamen spheno-palatinum; G. ophthalmicum, upon the oculo-motor nerve, between the lateral rectus muscle and the optic nerve.
4. **Relations of Ganglia:** (*a*) Entocranial; G. gasseri, with the facial through the petrosal nerve; with N. sympathicus through filaments to the carotid plexus.
   (*b*) Ectocranial; G. oticum, with the auriculo-temporal, the pterygoid (internal), the facial, the tensor tympani and the sympathic nerves; G. submaxillare, with the lingual nerve; G.

spheno-palatinum, with the spheno-palatine, the palatine, the vidian, the cephalic palatine and the naso-palatine nerves; G. ophthalmicum, with the oculo-motorius and the ciliary nerves.

5. **Principal Rami**: respective origins; distributions:

(*a*) **Nerve-trunks**: N. mandibularis at G. gasseri.
N. maxillaris at G. gasseri.
N. ophthalmicus at G. gasseri.

(*b*) **Rami of N. mandibularis**:

*N. temporo-auricularis*: The origin is at the oval foramen; the distribution is to the ectal ear, the cheek, the vibrissæ, the dorsal lip; anastomotic filaments are given to the facial nerve and to the labial plexus.

*N. massetericus*: The origin is at the oval foramen, the distribution is to the masseter muscle.

*N. temporalis internus*: The origin is common with the masseter nerve; the distribution is to the temporal muscle.

*N. pterygoideus externus*: The origin is at the oval foramen; the distribution is to the pterygoid muscle.

*M. buccalis*: The origin is at the oval foramen; the distribution is to the masseter muscle, the mucosa of the mouth and the labial plexus.

*N. lingualis*: The origin is common with the internal dental nerve at the oval foramen; the distribution is to the tongue, the mucosa of the mouth; it sustains commissural relations with the facial nerve through the chorda tympani, and with the hypo-glossal nerve; it gives off a pharyngeal nerve.

*N. dentalis*: The origin is common with the lingual; it is distributed to the mandibular teeth, to the chin; it becomes the mental nerve peripherad of the foramen mentale.

*N. mylo-hyoides*: The origin is common with the dental nerve; the distribution is to the mylo-hyoid muscle.

*N. digastricus* is a ramus of the mylo-hyoid; it is distributed to the digastric muscle.

*N. pterygoideus internus*: The origin is at the oval foramen; the distribution is to the pterygoid muscle.

*N. tensor tympani* has a common origin with the pterygoid, and is distributed to the tensor tympani muscle.

*Chorda tympani* is a commissural ramus from the lingual to the facial nerve.

(*c*) **Rami of N. maxillaris**:

*N. orbitalis*: The origin is at the round foramen; the distribution is to the dorsal lid, the lachrymal gland and the integument over the temple.

*N. malaris*: The origin is common with the orbital; the distribution is to the cheek, the dorsal lid and the labial plexus.

*N. spheno-palatinus* is a ramus from the maxillary nerve 5 mm. peripherad of the round foramen ; it is one of the roots of the spheno palatine ganglion.

*N. palatinus cephalicus* is a ramus of the maxillary nerve just peripherad of the spheno-palatine, and is distributed to the rugæ of the mouth and to the palate ; it also anastomoses with the naso-palatine nerve.

*N. palatinus caudalis* is an offset of the spheno-palatine ganglion, and is distributed to the soft palate and the rugæ of the mouth.

*N. naso-palatinus* is an offset of the same ganglion cephalad to the turbinated bones ; its terminal filaments anastomose with the cephalic palatine.

*NN. dentales* are given off from the maxillary nerve just dorsad of the alveoli, and, penetrating the bone, are distributed to the maxillary teeth.

*N. nasalis, N. labialis, N. palpebralis*, are terminal filaments of the maxillary nerve peripherad of the infra-orbital foramen, and are distributed to the side of the nose, to the papillæ and to the integument of the dorsal lip, the vibrissæ, the labial plexus and the ventral lid.

*N. vidianus* is a commissural nerve from the spheno-palatine ganglion to the facial nerve through the petrosal nerve, N. petrosus superficialis major.

(*d*) **Rami of N. ophthalmicus:**

*N. frontalis:* The origin is at the foramen lacerum anterius ; the nerve becomes N. supra-orbitalis and N. supra-trochlearis ; it is distributed to the forehead, the tactile hairs, the dorsal lid, the conjunctiva, the lacus lachrymalis and the side of the nose.

*N. oculo-nasalis:* The origin is at the foramen lacerum anterius ; it becomes the infra-trochlear and the caudal ethmoid nerves.

*N. ciliaris longus* is a ramus at the border of the optic nerve ; its termination is not demonstrated.

*N. ciliaris brevis* is a ramus from the ophthalmic ganglion ; its termination is with the long ciliary nerve.

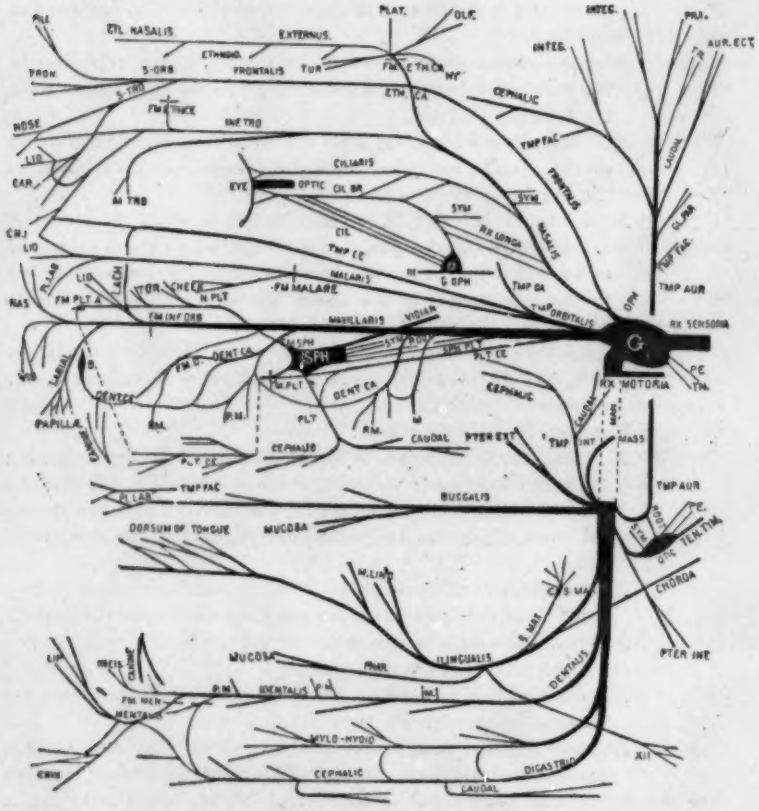
*N. infra trochlearis*, a ramus at the border of the mesal rectus muscle, is distributed to the trochlear muscle, the conjunctiva and the integument of the dorsal lid, the lacus lachrymalis and the side of the nose.

*N. ethmoideus caudalis* is the continuation of the trunk entad of the ethmoid foramen ; it is distributed to the dura mater, to the turbinated membrane ; it anastomoses with its platetrope, and becomes the *nervus externus*, which is given to the septum narium and to the nasal cartilage.

*B.* PHYSIOLOGICAL.

This nerve is chiefly sensory; there are fibres from the motor root and from the sympathic ganglia; it is a nerve of the special sense, taste; it sustains peculiar relations to glandular secretion in the lachrymal and salivary glands.

The indirect relation of this nerve with the facial, the glosso-pharyngeal and the vagus may have a profound pathological signification.




## EXPLANATION OF ABBREVIATIONS USED IN THE DIAGRAM.

No attempt has been made to draw the diagram to a scale or to show relations in perspective. To avoid confusion it was thought expedient to represent even the same structure in different parts of the diagram—*e. g.*, the labial plexus and the eyelid.

III, N. oculo motorius; XII, N. hypoglossus; Aur. ect., auris ectalis;

B., ganglion of Bochdalek; Ca., caudal; Ce., cephalic; Car., caruncula; Cil., N. ciliaris; Cil. br., N. ciliaris brevis; Cnj., conjunctiva; Dent., N. dentalis; Eth. ca., N. ethmoideus caudalis; Fm. eth., foramen ethmoideum; Fron., N. frontalis; G., ganglion gasseri; Gl. par., glandula parotidea; G. s-max., ganglion submaxillare; Hy., hypophysis; Integ., integument; Inf-tro., N. infra-trochlearis; Lach., N. lachrymalis; M., dens molaris; Man., N. mandibularis; Mass., N. masseter icus; M. ling., musculus lingualis; M. tro., musculus trochlearis; Nas., N. nasalis; N-plt., N. naso palatinus; O., G. ophthalmicum; Olf., nerve to olfactory lobe; Oph., N. ophthalmicus; P. M., dens premolaris; Pter., N. pterygoideus; Pe., N. petrosus; Pili., tactile hairs of forehead and of ear; Plat., the point in the meson where the ethmoid nerve joins its platetrope; Pl. lab., plexus labialis at the angle of the mouth; Plt., N. palatinus; S orb., N. supra-orbitalis; Sph., ganglion spheno-palatinum; S-tro., N. supra-trochlearis; Sym., anastomotic filaments to N. sympathicus; Ten. tym., N. tensor tympani; Tn., nerve from G. gasseri to the tentorium cerebelli; Tmp. aur., N. temporo-auricularis; Tmp. fac., anastomotic filaments to the temporo-facial nerve, VII; Tmp. int., N temporalis internus; Tur., filaments to the membrane over the turbinated bones; Tr., filament to the meatus in the region of the tragus.

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## *An Analytical Table of the Genera of Snakes. By E. D. Cope.*

*(Read before the American Philosophical Society, May 21, 1886.)*

The following key was prepared as preliminary to a discussion of the genera and species of North American Snakes to be published by the Smithsonian Institution. As this work will not be ready for publication for some months, I publish the present extract from it by permission of the Secretary, Prof. S. F. Baird. It is to be hoped that it may be useful in clearing up some of the obscurity which has existed with regard to the definitions of some forms; and that it may show that in some instances exact definition requires further separation of such groups, while in others combinations are necessary.

For the definitions of genera which I have not seen, I am especially indebted to my colleagues in this department, Drs. Peters, Günther, Jan, Krefft, and others.

### OPHIDIA.

The families of snakes are distinguished by the following osteological characters:*

A. Opisthotic intercalated in the cranial walls (*Angiostomata*).

* No ectopterygoid; palatines bounding choanæ posteriorly; ethmoturbinal forming part of roof of mouth; rudiments of pelvis (*Scolecophidia*).†

I. Maxillary bone fixed to prefrontal and premaxillary; a pubis ..... CATODONTA.‡

II. Maxillary bone vertical and free from all others; no pubis ..... EPANODONTA.§

** An ectopterygoid; palatines not bounding choanæ posteriorly.

III. Maxillary bone free, horizontal..... TORTRICINA.

† A coronoid bone.

*a.* Rudimentary posterior extremities..... *Tortricidæ* Müller.

*aa.* No rudiments of posterior extremities..... *Uropeltidæ* Müller.

B. Opisthotic attached scale-like to cranial walls, and produced freely. Ectopterygoid present (*Eurystomata*).

IV. Maxillary bone horizontal, in contact with the premaxillary, and furnished with solid teeth. No rudiments of pelvis..... ASINEA.

a. Rudiments of posterior extremities (*Peropoda*).

β. Coronoid bone present.

Supraorbital and postorbital bones, and premaxillary teeth present ..... *Pythonidæ* Cope.

No supraorbitals or premaxillary teeth; postorbitals present. *Boidæ* Cope.

* This arrangement was first published by the writer in the Proceedings of the Philadelphia Academy for 1844, p. 230. The definitions of the lower primary divisions were derived from J. Müller.

† The characters of this division as I originally gave them (Proceedings Academy Philada., 1864, p. 230) were derived from J. Müller, which have been shown to be partially erroneous by Duméril and Bibron, and Peters.

‡ Includes only the family *Stenostomidæ*.

§ One family, the *Typhlopidæ*.

$\beta\beta$. No coronoid bone.

No supraorbitals nor postorbitals nor premaxillary teeth. *Charinidæ* Cope.

$\alpha\alpha$. No rudiments of posterior extremities (*Colubroidea*.)

$\beta$. Coronoid bone present.

No postorbital or supraorbital bones; premaxillary teeth present *Xenopeltidæ* Cope.

$\beta\beta$. No coronoid bone.

$\gamma$. Postorbital bone produced over the superciliary region.

No gastrosteges.....*Acrochordidæ* Cope.

Gastrosteges present.....*Nothopidæ* Cope.

$\gamma\gamma$. Post orbital bone not extending over the superciliary region.

$\delta$. Nostril in or between nasal plates.....*Colubridæ* Auct.

$\varepsilon$. Vertebral hypapophyses confined to the anterior part of the column.....*Colubrinæ*.

$\varepsilon\varepsilon$. Vertebral hypapophyses extending throughout the column *Homalopsinæ* Cope.

$\delta\delta$. Nostril in the rostral plate.....*Acontiophidæ* Gthr.

V. Os maxillare horizontal, thickened in front, and not reaching the premaxillare anteriorly, and bearing a perforate tooth PROTEROGLYPHA.

$\alpha$. Caudal hypapophyses bifid; caudal neural spines and pleurapophyses short.

Postfrontal bones wanting; fang grooved.....*Elapidæ* Cope.

Postfrontals present; fang grooved.....*Najidæ* Cope.

Postfrontals present; fang not grooved.....*Dendraspididæ* Gthr.

$\alpha\alpha$. Caudal hypapophyses simple; caudal neural spines and pleurapophyses elongate.

A postfrontal bone.....*Hydrophidæ* Gthr.

VI. Maxillary bone vertical, not reaching premaxillary, articulating with the prefrontal by a ginglymus, and to the ectopterygoid without imbrication, and bearing a perforated tooth.....SOLENOGLYPHA.

Maxillary bone not excavated; fang not grooved in front; no postfrontal bone.....*Atractaspididæ* Gthr.

Maxillary bone not excavated; fang grooved in front; a postfrontal *Causidæ* Cope.

Maxillary bone not excavated; fang not grooved; a postfrontal *Viperidæ* Gray.

Maxillary bone excavated by a large chamber; fang not grooved in front; a postfrontal.....*Crotalidæ* Gray.

In the following pages I present synoptical diagnoses of the genera of the Ophidia arranged in key form. These are placed under subfamily heads, which are not, with the exception of the Homalopsinæ, defined. It is not certain, therefore, that their contents are in all cases properly limited or distributed. It remains a desideratum to discover the characters of the natural divisions of the Colubridæ, if any there be. The characters presented by Duméril and Bibron, and by Günther, are important but in-

sufficient. For the definition of the genera distinct characters exist, although the subject is one of much difficulty. The object of definition being, as I imagine, precision, and the consequent increased facility of determination, I have employed all structural characters whatever, and only neglected them where it is evident that they are inconstant within the limits of a species. I find of the greatest importance the grooved or non grooved characters of the posterior teeth, and the absence or number of the scale-pits. The division or non-division of the anal scutum is also of much importance, although in a very few genera (*e. g.*, Xenodon) it is not constant Relying, as the system always must, on exact characters, I have not allowed considerations of "physiognomy" to change a result where it conflicts with structure, which is, however, rarely the case. The tendency of some authors to neglect characters and to depend on "physiognomy" destroys precision and explains nothing, besides rendering identification of species most laborious, resting as it must in that case on purely empirical methods. I also do not use as generic characters the number of rows of scales, or of labial scuta, believing that these are only available in the distinction of species.

In a few instances I have not been able to examine the skeletons of genera of doubtful position, so that their reference to a family division may yet have to be altered. I have, however, studied the fine series in the museums of Paris and Washington, besides a considerable number in my own collection. For the characters of many genera which I have not seen I have had to rely on the descriptions of others, especially of Drs. Peters and Günther.

## EPANODONTA.

### TYPHLOPIDÆ.

I. Muzzle covered above by rostral and internasal scuta.

*a*. Two ocular plates and a preocular.

One nasal plate.....*Letheobia* Cope.

*aa*. One ocular and a preocular.

One nasal plate.....*Typhlops* Schn.

Two nasal plates.....*Helminthophis** Pet.

*aaa*. One ocular and no preocular.

One nasal plate.....*Typhlina*† Wagl.

Two nasal plates.....*Liotyphlops*‡ Pet.

II. Muzzle and front with five symmetrical scuta.

Two nasals and a preocular.....*Anomalepis* Jan.

## CATODONTA.

### STENOSTOMIDÆ.

Superciliary scales present.....*Stenostoma* Wagl.

No superciliary scales.....*Rena* B. & G.§

* *Idiotyphlops* Jan.

† *Pilidion* Dum. Bibr. *Typhlinalis* Gray.

‡ *Rhinotyplops* Pet.

§ *Catodon* D. & B., not of Lacep. *Stigonodon* Peters.

## TORTRICINA.

### TORTRICIDÆ.

Intermaxillary bone dentate ; eye covered by a single scute. *Tortrix* Oppel.
Intermaxillary edentulous ; eye surrounded by distinct scales *Cylindrophis* Wagl.

### RHINOPHIDÆ.

I. Tail terminating in a large shield.
Rostral plate produced posteriorly, separating the nasals. *Rhinophis* Hemp.
Rostral not produced ; nasals in contact..... *Uropeltis* Cuv.
II. Tail scaly to end.
Tail terminating in a disk of keeled scales ; supraorbitals and postocular confluent..... *Silybura* Gr.
Tail compressed, truncated, terminating in a bicuspid scale, the points superposed ; postocular distinct..... *Plectrurus* D. & B.
Tail tapering, terminal scute ending in a horizontal ridge ; no chin-groove *Platyplectrurus* Günth.
Tail tapering, ending in a single point ; no chin groove *Teretrurus* Bedd.
Tail with smooth scales, terminating in one or two points ; postocular united with superciliary ; a median chin-groove.. *Melanophidium* Gthr.

## ASINEA.

### XENOPELTIDÆ.

Eyes not covered with a plate ; head with normal shields, with an interparietal added ; scales smooth ; anal and subcaudals divided ; teeth equal..... *Xenopeltis* Reinw.

### PYTHONIDÆ.

I. Premaxillary teeth present.
*a*. Fossæ in labial plates of both jaws.
Scuta on end of muzzle only..... *Morelia* Gray.
Scuta extending to between orbits..... *Python* Daudin.
Scuta covering vertex and muzzle..... *Liasis** Gray.
*aa*. Fossæ in inferior labials only.
Muzzle shielded to frontal region..... *Nardoa* Gray.
*aaa*. No labial fossæ
Head shielded ; tail prehensile..... *Aspidiotes* Krefft.
Head with nine regular shields above ; rostrals plate protuberant; tail not prehensile..... *Loxocemus* Cope.
II. No premaxillary teeth.†
Labial plates with fossæ ; vertex and front squamous ; nostril in one nasal ; scales smooth..... *Chondropython* Meyer.
Head covered with large scuta..... *Aspidopython* Meyer.

* *Liopython* Hubrecht.
† *Teste* Boulenger.

## BOIDÆ.

I. Tail prehensile.

*a.* Scales smooth.

*β.* Labial fossæ present.

Plates on muzzle only.....*Xiphosoma** Wagl.
Plates extending over muzzle and front.....*Epicrates*† Wagl.

*ββ.* No labial fossæ.

Muzzle and front scaled; nasal plates meeting.....*Lichanura* Cope.
Muzzle and front scaled; nasal plates widely separated.....*Boa*‡ Linn.
Muzzle and front scutate; nares vertical.....*Eunectes* Wagl.
Muzzle and front with scuta divided on the median line; nares lateral
*Chilabothrus*§ D. & B.
Muzzle and front with median scuta; nares lateral...*Ungualiophis* Meyer.

*aa.* Scales carinate.

Top of head with symmetrical plates; nares between two
*Ungualia*‖ Gray.
Top of head with symmetrical plates; nares in a single plate
*Bolieria*¶ Gray.
Plates on muzzle only.....*Casarea*** Gray.
Top of head scaly; rostral plate forming border of mouth.*Enygrus* Wagl.
Top of head scaly; labial plates meeting below rostral plate
*Trachyboa* Pet.

II. Tail not prehensile.

*a.* Palatine teeth well developed.

*β.* Rudiments of hind limbs visible.

A mental groove.....*Gonglyophis* Wagl.
No mental groove.....*Eryx*†† Daud.

*ββ.* No visible rudiments of hind limbs.

Scales keeled; head very distinct.....*Erebophis* Gthr.

*aa.* Palatine teeth none (Peters).

Scales smooth; top of head with symmetrical plates to between orbits; one nasal.....*Calabaria*‡‡ Gray.

## CHARINIDÆ.

Head scutate above; scales smooth; tail not prehensile; palatine teeth
*Charina*§§ Gray.

* *Corallus* and *Chrysenis* Gray.
† *Epicarsus* Fisch.
‡ *Acrantophis* Jan.
§ Includes *Homalochilus* Fisch.; *Pelophilus* D. & B. (= *Sanzinia* Gray); *Dendrophilus* Jan, and *Piesigaster* Scoane.
‖ *Tropidophis* D. & B. *Notophis* Hallow.
¶ *Platygaster* D. & B.
** *Leptoboa* D. & B.
†† *Cusoria* Gray.
‡‡ *Rhoptrura* Peters; may belong to the Charinidæ.
§§ *Wenona* B. & G.

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## ACROCHORDIDÆ.

Body compressed, acute below.....*Chersydrus* Cuv.
Body round, flat below.....*Acrochordus* Hornst.

## NOTHOPIDÆ.

Scales above granular, with rows of tubercular scales; urosteges simple; no frontal or parietal plates.....*Xenodermus* Rhdt.
Scales squamous; urosteges double; head scaly, with frontal and parietal plates.....*Nothopsis* Cope.

## COLUBRIDÆ.

Head conic, not distinct from the body, which is cylindric and rigid CALAMARINÆ.
Head slightly distinct, short; teeth entire, not enlarged in front CORONELLINÆ.
Head similar to last; posterior tooth grooved .....SCYTALINÆ.
Head more distinct and elongate, body and tail longer; teeth entire, not longer in front.....COLUBRINÆ.
Like the last, but grooved teeth posteriorly.....PHILODRYADINÆ.
Very slender; pupil horizontal; grooved teeth.....DRYOPHIDINÆ.
Less slender, not compressed; middle teeth elongate, posterior teeth grooved ..... .....PSAMMOPHIDINÆ.
Anterior maxillary and mandibular teeth enlarged.....LYCODONTINÆ.
Anterior teeth not abruptly enlarged, posterior grooved; head wide, very distinct, body compressed.....DIPSADINÆ.
Anterior teeth not abruptly enlarged, the posterior weak and not grooved; head very distinct from the body, which is compressed; no œsophageal teeth.....LEPTOGNATHINÆ.
Maxillary teeth few and rudimental; body slender; hypapophyses piercing throat, and capped with enamel.....DASYPELTINÆ.
Hypapophyses spinous to caudal region; anterior teeth not enlarged; body not slender; head distinct.....HOMALOPSINÆ.

### CALAMARINÆ.

I. Posterior maxillary tooth grooved.

* Subcaudal scuta.

One nasal; anal undivided.....*Uriechis** Pet.
Two nasals; anal divided.....*Cercocalamus* Gthr.

** Subcaudal scutella.

† No internasals.

One nasal, no preocular.....*Amblyodipsas* Pet.
One nasal, a preocular.....*Apostolepis* Cope.

†† Two internasals; prefrontals united together.

One nasal; a preocular.....*Phalotris* Cope.

††† Internasals united with nasals.

Postnasal distinct, anal divided.....*Stenorhina* D. & B.

†††† Two internasals and two prefrontals.

* *Poiemon* Jan.

*a*. Nasal plate single.

No preocular; no loreal.....*Calamelaps** Gthr.
A preocular; rostral not prominent.....*Elapomorphus*† Wieg.
A preocular; rostral prominent..... *Ogmius* Cope.

*aa*. Two nasal plates.

$\beta$. Two anal scuta.

No preocular; a loreal.....*Enulius*‡ Cope.
A preocular; no loreal.....*Tantilla*§ B. & G.
A preocular and loreal, tail smooth.....*Hydrocalamus* Cope.
A preocular and loreal, tail short, rugose.....*Procinura* Cope.

$\beta\beta$. One anal scutum.

A loreal and preocular; tail smooth.....*Scolecophis* Cope.

II. Posterior maxillary teeth smooth.

* Subcaudal scuta.

† Internasals united.

Scales smooth.....*Aspidura* Wagl.
Scales keeled.....*Haplocercus* Gthr.

††. Internasals and prefrontals distinct.

*a*. Rostral not produced.

Postoculars not distinct from temporals; one nasal; loreal joined to preocular.....*Achalinus* Pet.
Postocular, preocular, and two nasals.....*Elapops*‖ Gthr.

*aa*. Rostral produced.

Two nasals and a loreal and preocular.....*Rhinochilus* B. & G.

** Subcaudal scutella.

† Nasal scuta well developed.

‡ No internasal scuta.

| Rostral plate produced.

Prefrontals separated by rostral; nasals and first labial confluent *Ficimia* Gray.
Prefrontals in contact; nasal distinct; rostral little produced *Conopsis* Gthr.
Rostral much produced.....*Rhynchonyx*¶ Pet.

|| Rostral not produced.

Nasal confluent with first labial; preocular and loreal distinct *Sympholis*** Cope.
Nasal distinct; loreal and preocular united..... *Geophidium*†† Pet.

‡‡ One internasal scutum.

| Prefontals united.

Rostral much produced.....*Ligonirostra*‡‡ Cope.

|| Two prefrontals (rostral not produced).

* *Micrelaps* Bœttg.
† *Urobelus* Rhdt.
‡ Not of Bocourt Miss. Sci. Mex.
§ *Homalocranium* D. & B.
‖ *Pariaspis* Cope.
¶ *Xenocalamus* Gthr.
** *Chilorhina* Jan.
†† *Xylophis* Bedd.
‡‡ *Temnorhynchus* Smith.

Scales keeled; no preocular, two anals. ..... *Haldea** B. & G.
Scales keeled; no loreal; a preocular; anal double.... *Falconeria* Theob.
Scales smooth; no preocular, two anals..... *Furancia* Gray.
Scales smooth; no loreal; a preocular..... *Pseudoeryx*† Fitz.
Scales smooth; no loreal nor preocular; one anal; (? teeth)
*Calamophis* Meyer.

‡‡‡ Two internasals; one prefrontal.

Rostral much produced..... *Prosymna* Gray.
Rostral not produced, teeth equal..... *Trimetopon* Cope.
Rostral not produced, teeth diacranterian..... *Colorhogia* Cope.

‡‡‡‡ Two internasals and two prefontals.

§ Rostral plate reaching frontal.

Nasals and first labial confluent..... *Gyalopium* Cope.

§§ Rostral plate not reaching frontal.

*a*. Posterior maxillary teeth elongate.

Two nasals well separated from preocular..... *Arrhyton* Gthr.
Two nasals in contact with frenoöcular..... *Leptocalamus* Gthr.

*aa*. Teeth equal.

$\beta$. Superciliary plate absent.

Two nasals and a frenoörbital..... *Colophrys* Cope.

$\beta\beta$. Superciliary present.

$\gamma$. Rostral plate produced.

$\delta$. Nasal plates distinct below.

No loreal; anal divided; two nasals..... *Geagras*‡ Cope.
A loreal; anal entire; two nasals..... *Cemophora* Cope.
A loreal; anal divided; one nasal..... *Chionactis*§ Cope.

$\delta\delta$. Nasal plates united with first labial.

A preocular and a divided anal..... *Chilomeniscus*‖ Cope.

$\gamma\gamma$. Rostral plate not produced.

$\varepsilon$. Palatine bones with teeth.

$\eta$. One nasal plate; one anal plate.

Scales smooth..... *Homalosoma*¶ Wagl.

$\eta\eta$. One nasal and two anal plates.

Loreal and preocular present..... *Contia*** B. & G.
Loreal present, no preocular ..... *Abastor*†† Gray.
Neither loreal nor preocular..... *Oxyorrhos* Fischer.‡‡

$\eta\eta\eta$. Two nasal, one anal plate.

Maxillary bone very slender; scales smooth; a frenoörbital plate
*Stenognathus*§§ D. & B.

* *Conocephalus* D. & B.
† *Dimades* Gray. *Calopisma* D. & B. *Hydrops* Wagl.
‡ *Enulius* Boc. *Sphenocalamus* Fisch. *Pseudoficimia* Boc.
§ *Lamprosoma* Hallow.
‖ *Bergenia* Steindachner.
¶ *Rhabdium* D. & B.
** *Cryptodacus* Peters. *Eirenis* Jan.
†† *Carphophiops* Gerv. *Carphophis* D. & B. *Celuta* B. & G.
‡‡ 1879; *Atractocephalus* Sauv. ? 1880.
§§ *Platypteryx* D. & B.

Maxillary more robust; scales smooth; a frenoörbital plate
*Rhabdosoma** D. & B.
Maxillary more robust; scales keeled; a frenoörbital plate
*Elapoides*† Boie.

ηηηη. Two nasal and two anal scuta.

A loreal; no preocular; two pairs genеials..... *Virginia* B. & G.
A loreal; no preocular; one pair genеials..... *Adelphicus*‡ Jan.
A loreal and a preocular; two pairs genеials..... *Sonora* B. & G.
No loreal; a preocular; jaws weak..... *Brachyorrhos* Kuhl.

εε. Palatine bones without teeth.

Two anals and nasals; a loreal and a preocular..... *Oligodon* Boie.
Two anals and nasals; a loreal and no preocular..... *Colobognathus* Pet.

††. Nasal scutum minute.

No internasals; preoculars present..... *Calamaria* Boie.
Two internasals; a preocular..... *Pseudorhabdium* Jan.
Two internasals; no preocular..... *Oxycalamus* Cant.

†††. No nasal scutum.

No loreal, nor pre- nor postocular..... *Typhlogeophis* Günth.

CORONELLINÆ.

I. No palatine teeth.

Anals two; one internasal; scales smooth..... *Tripeltis*§ Cope.
Anal plate divided; two internasals; scales smooth..... *Oligodon*‖ Boie.

II. Palatine teeth present.

α. Dentition isodont or syncranterian.

β. Anal plate divided.

γ. Angular bone enclosed by the dentary.

ε. Teeth equal.

One scale-pit, rostral not produced..... *Diadophis* B. & G.
No scale-pits, rostral not produced..... *Rhadinæa*¶ Cope.
Rostral large, produced, with acute edge in front; two nasals; loreal present..... *Scaphiophis* Pet.

εε. Teeth longer posteriorly.

Tail short; rostral produced..... *Simotes* D. & B.
Tail short; rostral not prominent; one scale-pit..... *Coronella*** Laur.
Tail very long; rostral not prominent..... *Pliocercus*†† Cope.

γγ. Dentary bone attached loosely to the apex of the angular.

Teeth equal; no scale-pits..... *Henicognathus* D. & B.

ββ. Anal plate undivided.

* *Rhabdium*, D. & B.
† *Geophis* Wagl. *Catastoma* Wagl
‡ *Rhabdosoma* Boc. not D. & B. *Rhegnops* Cope.
§ Gen. nov. type *Oligodon brevicauda* Gthr.
‖ ? *Rhynchocalamus* Gthr.
¶ *Ablabes* Günth. not D. & B. *Enicognathus* Jan.
** *Mizodon* Fisch.
†† *Elapochrus* Pet. *Cosmiosophis* Jan.

Rostral plate produced both anteriorly and posteriorly..*Holarchus** Cope.
No scale-pits; rostral plate not produced.....*Megablabes* Gthr.
Two scale-pits.....?...*Ophibolus*† B. & G.

*aa*. Dentition diacranterian.

*β*. Rostral plate normal.

*γ*. Anal plate entire.

Eye bounded by scales below; lores plane.....*Cyclagras*‡ Cope.
Eye resting on labial plates; lores plane.....*Xenodon*§ Boie.
Eye on labials; lores grooved; two scale-pits.....*Teleolepis* Cope.

*γγ*. Anal plate divided.‖

*δ*. Scale-pits present (one).

Head very distinct; robust.....*Xenodon* Boie.
Head little distinct; slender.....*Liophis* Wagl.

*δδ*. No scale-pits.

*ε*. Rostral plate normal.

Tail short; pupil erect; lores flat.....*Hypsiglena*¶ Cope.
Tail short; pupil round; body robust.....*Opheomorphus* Cope.
Tail short; pupil round; body slender.....*Aporophis* Cope.
Tail very long; pupil round; slender.....*Dromicus* Bibr.

*εε*. Rostral plate produced backwards and laterally, not forwards.

Anal divided; loreal present.....*Lytorhynchus*** Pet.

*ββ*. Rostral trihedral and produced.

Anal divided; scales keeled.....*Heterodon* Beauv.
Anal divided; scales smooth.....*Lystrophis*†† Cope.
Anal entire; scales smooth.....*Lioheterodon* Dum.

### Scytalinæ.

*α*. Anterior teeth elongate.

Scales smooth; rostral plate obtuse.....*Macroprotodon* Guich.

*aa*. Anterior teeth short.

*β*. Rostral plate not protuberant.

*γ*. Two rows of subcaudal scutella.

*δ*. Anal plate entire.

*ε*. Vertebræ with expanded neural spines.

Prefontals united; a loreal; scales smooth.....*Gerrhosteus* Cope.

* Gen. nov., embracing all species with entire anal plate hitherto referred to Simotes.

† *Lampropeltis* Fitz., Cope, *Bellophis* Lockingt.

‡ *Lejosophis* Jan.

§ *Xenodon suspectus* Cope; *X. colubrinus* Gthr.; *X. angustirostris* Pet.; and *X. bipræocularis* Cope: and double or single in *X. rhabdocephalus* Wied.

‖ *Pseudoxyrrhopus* Günthr. (? *Homalocephalus* Jan.) is probably identical with one of the genera of sect. γγ, but the character of the scale-pits is unknown.

¶ *Pseudodipsas* Pet. *Comastes* Jan.

** *Catachlein* Jan, *Ophirhina* Bocage.

†† Type *Heterodon dorbignyi*.

εε. Vertebræ with narrow compressed neural spines.

Scale-pits double; pupil erect; rostral plate normal; two prefrontals.
*Oxyrrhopus** Wagl.

Rostral plate normal; one nasal plate; two prefrontals
*Tomodon* D. & B.

Rostral plate separating internasals; scale pores single; two prefrontals.
*Trimerorhinus*† Smith.

δδ. Anal plate double.

ε. Scales smooth.

No scale-pits; tail short; rostral obtuse; nasals two; pupil round
*Erythrolamprus*‡ Boie.

One scale-pit; loreal not in orbit; rostral obtuse; nasals two; pupil round..... *Tachymenis* Wiegem.

Loreal entering orbit; pupil erect; rostral obtuse; nasals two
*Tarbophis*§ Fleisch.

One nasal plate; no scale-pits; rostral truncate; pupil erect
*Manolepis*‖ Cope.

εε. Scales keeled.

Pupil erect; anal double..... *Dryophylax* Wagl.

γγ. One row of subcaudal scuta.

Two preoculars; head distinct; body compressed..... *Ditypophis* Gthr.
Two preoculars; body round; head not distinct.... *Hologerrhum* Günth.
One preocular; body round..... *Scytale*¶ Boie.

ββ. Rostral plate protuberant.

γ. Rostral not recurved.

Loreal not entering orbit; pupil round; two nasal plates; rostral moderate..... *Conophis* Pet.
Scales not grooved; rostral very prominent..... *Rhamphiophis* Pet.
Scales grooved; rostral prominent ..... *Rhagerhis* Pet.

γγ. Rostral plate recurved.

One row of subcaudal scuta..... *Phimophis*** Cope.
Two rows of subcaudal scutella..... *Rhinostoma* Wagl.

COLUBRINÆ.

A. Posterior maxillary teeth not abruptly longer than those that precede them.

1. Rostral plate expanded transversely and with free lateral borders.

Several preoculars; scales smooth, anal and subcaudals double
*Salvadora*†† B. & G.

2. Rostral plate not expanded and free laterally.

* Two median dorsal row of scales.

One preocular plate..... *Herpetodryas*‡‡ Boie.

* Includes *Brachyrhytum* D. & B.
† *Psammophylax* (Fitz) Günther.
‡ *Coniophanes* Hallow.
§ Günther says (Catal. Brit. Mus. p. 33) "anal bifid."
‖ Type *Tomodon nasutus* Cope.
¶ *Olisthenes* Cope.
** *Rhinosimus* D. & B. preoccupied.
†† Preoccupied in botany, hence *Phimothyra* Cope.
‡‡ *Phyllosira* Cope.

Two preocular plates..... .....*Zaöcys* Cope.

** One median dorsal row of scales.

† Body little or not compressed.

‡ Internasals not confluent with nasals.

*a*. Several loreal plates.

Two or more preoculars.....*Ptyas* Cope.

*aa*. One loreal (rarely two).

*β*. Four or more prefontals.

Anal entire; scales keeled.....*Pityophis* Holbr.

*ββ*. Two prefrontals only.

*γ*. Two nasal plates.

*δ*. Anal entire.

Scales smooth; rostral produced.....*Rhinechis** Mich.

One preocular: rostral not produced.....*Spilotes*† Wagl.

*δδ*. Anal double.

*ε*. One preocular.

Form robust; tail moderate.....*Coluber*‡ L.

Form elongate; tail long.....*Drymobius*§ Cope.

Form very slender; tail very long.....*Dendrophis* Boie.

*εε*. Two preoculars.

Scales keeled.....*Elaphis* Aldv.

Scales smooth.....*Bascanium*‖ B. & G.

*γγ*. One nasal plate.

Scales keeled; a loreal plate.....*Cyclophis*¶ Gthr.

Scales smooth; a loreal plate.....*Liopeltis* Cope.

Scales smooth; no loreal.....*Phragmitophis* Gthr.

‡‡ Internasals confluent with nasals.

Scales smooth with one pit; anal divided.....*Symphimus* Cope.

†† Body much compressed.

One nasal plate; a frenoörbital.....*Dryocalamus* Gthr.

Two nasals; a frenoörbital; teeth equal.....*Odontomus*** D. & B.

Two nasals; loreal and preocular distinct.....*Gonyosoma* Wagl.

One nasal; a loreal; scales keeled; teeth equal.....*Phyllophis* Gthr.

AA. Posterior maxillary tooth abruptly longer than those which precede it.

*a*. Maxillary tooth series uninterrupted (one preocular).

*β*. Moderately elongate.

Scales smooth; two nasals; a frenoörbital.....*Nymphophidium* Gthr.

Scales keeled; one loreal; one preocular.....*Herpetoreas* Gthr.

*ββ*. Very slender.

* *Arizona* Kenn.

† *Cynophis* Gray. *Compsosoma* D. & B. *Cælognathus* Fitz. *Geoptyas* Steind.

‡ *Calopeltis* Bp. *Grayia* Gthr. *Heteronotus* Hallow, nom. praeocc.. hinc *Glaniolestes* Cope. *Lejonotus* Jan.

§ *Dendrophidium* Cope.

‖ *Masticophis* B. & G.

¶ *Opheodrys* Fitz., Cope. *Philophyllophis* Garm.

** *Hydrophobus* Gthr.

γ. Anal double.

Scales keeled; no loreal ..... *Leptophis** Bell.
Scales keeled; a loreal ..... *Hapsidophrys* Fisch.
Scales smooth; a loreal ..... *Philothamnus*† Smith.

γγ. Anal single.

Scales smooth; a loreal ..... *Chlorophis*‡ Hallow.

*aa.* A toothless space in front of the long maxillary tooth.

β. One preocular; anal double.

γ. Form very elongate.

A loreal; scales smooth ..... *Uromacer* D. & B.

γγ. Form moderately elongate.

A loreal; scales smooth, with two pits ..... *Alsophis* Cope.
No loreal; scales smooth ..... *Ocyophis*§ Cope.

ββ. Two or more preoculars.

Orbit resting on labials; one loreal; two anals; two scale-pits *Zamenis* Wagl.
Orbit surrounded by scales; anal single; two scale-pits; one loreal *Periops* Wagl.
Orbit surrounded by scales; two or more loreals; anal single; two scale-pits ..... *Chilolepis*‖ Cope.
"Numerous small scales occupying the place of the frontals;" eye resting on scales ..... *Spalerophis* Jan.
Orbit resting on labials; two anals; one scale-pit ..... *Tyria*¶ Cope.
One anal; no scale-pits ..... *Zamenophis* Gthr.

PHILODRYADINÆ.

A. Body rounded, not compressed.

*a.* Scales grooved.

Crown and lores grooved; one nasal; two loreals ..... *Malpolon*** Fitz.

*aa.* Scales smooth.

Two loreals; middle teeth equal ..... *Callirhinus* Gird.
One loreal; median teeth equal ..... *Philodryas* Wagl.
One loreal; median maxillary teeth long ..... *Jaltris* Cope.

*aaa.* Scales keeled.

One loreal; median teeth equal ..... *Tropidodryas* Cope.

AA. Body slender, compressed.

*a.* Subcaudal scutella.

Nostril normal; two nasals; two anals ..... *Chrysopelea* Boie.
Nostril round in a single nasal; two anals ..... *Ichthycyphus* Gthr.
Nostril semicircular, valvular ..... *Dromophis* Pet.

*aa.* Subcaudal scuta.

Anal divided ..... *Bucephalus* Sm.

* *Ahætulla* Gthr. *Thrasops* Hallow.
† *Rhamnophis* Gthr. *Gastropyxis* Cope.
‡ *Herpetæthiops* Gthr.
§ Type *Dromicus ater* Gosse.
‖ Type *Coluber cliffordii* Schl.
¶ Type *T. dahlii* Fitz.
** *Cœlopeltis* Wagl. *Taphrometopon* Brandt.

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DRYOPHIDINÆ.

I. Middle maxillaries not elongate, posteriors grooved.
*a.* An elongate nasal appendage.
Nasal and anal scuta undivided; scales keeled.....*Langaha* Brug.
*aa.* No nasal appendage.
Scales keeled.....*Dryophis** Boie.
Scales smooth.....*Dryinus* Wagl.
II. Middle maxillaries elongate; posteriors grooved.
*a.* An elongate nasal appendage.
Pupil horizontal.....*Passerita* Gray.
*aa.* No elongate nasal appendage.
A loreal plate; prenasals joined on the middle line.....*Gephyrinus*† Cope.
A loreal plate; nasals not joined.....*Tragops* Wagl.
No loreal plate; nasals separate.....*Tropidococcyx* Gthr.

PSAMMOPHIDINÆ.

Anal entire; a loreal.....*Psammodynastes* Gthr.
Anal divided; a loreal.....*Psammophis* Wagl.
Nostril in prenasal; no loreal.....*Mimophis* Gthr.

LYCODONTINÆ.

I. Anterior maxillaries not isolated.
*a.* Subcaudal scuta double.
*β.* Dorsal scales of equal size.
Two nasals; nostril in the anterior; a loreal; body much compressed
*Lycodryas* Gthr.
Two nasals; nostril between; body not compressed; lores plane
*Boödon*‡ D. & B.
Two nasals; body not compressed; lores longitudinally grooved
*Bothrophthalmus*§ Schl.
Two nasals; nostril in the anterior.....*Lycophidium*‖ Fitz.
One nasal; a loreal.....*Metoporhina* Gthr.
*ββ.* Dorsal scales of unequal size.
Vertebral series smooth; body compressed.....*Hormonotus* Hallow.
Vertebral series smooth; body round.....*Lamprophis* Fitz.
Vertebral series bicarinate; body round.....*Simocephalus*¶ Gray.
*aa.* Subcaudal scutella entire.
Two nasals; scales equal, smooth.....*Holuropholis* Dum.

*Thelotornis* Smith. *Cladophis* Dum.
† Type *Dryophis fronticincta* Gthr.
‡ *Eugnathus* D. & B.
§ Belongs perhaps to Colubrinæ.
‖ *Alopecium* D. & B.
¶ *Heterolepis* Sm. *Diaphorolepis* Jan.

II. Anterior maxillaries isolated.

*a*. Subcaudals in two rows.

*β*. Nareal region with a pit.

Scales smooth; anal entire..... ...*Bothrolycus* Gthr.

*β*. No nareal pit.

*γ*. Longest teeth at middle and posterior end of maxillary bone.

Two nasals; body round.....*Dinodon** D. & B.

*γγ*. Longest teeth at front of maxillary.

Scales keeled; two nasals; a loreal .....*Ophites* Wagl.

Scales smooth; two nasals; a loreal.....*Lycodon* Boie.

Scales smooth; two nasals; no loreal.....*Tetragonosoma* Gthr.

Scales smooth; one nasal; a loreal .....*Leptorhytaon* Gthr.

*aa*. Subcaudal plates in one row.

Scales keeled .....*Cercaspis* Wagl.

Scales smooth.....*Cyclocorus* D. & B.

LEPTOGNATHINÆ.

*a*. Subcaudal scuta entire.

Teeth of equal lengths.....*Anoplodipsas* Pet.

Teeth elongate posteriorly..... .....*Dipsadoboa* Gthr.

Teeth longer anteriorly.....*Amblycephalus* Kuhl.

*aa*. Subcaudal scuta in two rows.

*β*. A median genеial plate.

Maxillary bone very short; one nasal plate.....*Asthenodipsas* Pet.

Maxillary bone long; two nasal plates.....*Mesopeltis*† Cope.

*ββ*. No median genеial plate.

Teeth weak; equal; two nasals.....*Leptognathus* D. & B.

Teeth longer in front; one nasal.....*Pareas* Wagl.

DIPSADINÆ.

I. Subcaudal scuta.

Parietal plates replaced by scales; other plates normal..*Pythonodipsas* Gthr.

II. Subcaudal scutella.

*a*. No teeth anterior to the grooved maxillary.

Scales smooth .....*Opisthoplus* Pet.

*aa*. Median maxillary teeth not much shortened.

Nostril large, between two nasals and the internasal; vertebral scales larger.....*Rhinobothryum* Wagl.

Two nasals enclosing nostril; body elongate, compressed, anal entire; vertebrals generally larger..... *Dipsas*‡ Laur.

Two nasals enclosing nostril; body less compressed; anal double; vertebral row not larger; one loreal.....*Sibon*‡ Fitz.

* *Eumesodon* Cope.

† *Asthenognathus* Boc.

‡ *Boiga* Fitz. *Triglyphodon* et *Himantodes* D. & B. *Eudipsas* Gthr. *Toxicodryas* Hallow.

*Crotaphopeltis* Fitz. *Leptodira* Gthr.

No nasal; vertebrals equal.....*Hemidipsas** Gthr.

*aaa.* Median maxillary teeth shortened.

Two nasals and two or more loreals; anal double; vertebrals equal. *Trimorphodon* Cope.

DASYPELTINÆ.

No grooved maxillary tooth; no loreal plate; scales keeled; head very distinct.....*Dasypeltis*†† Wagl.

A grooved maxillary tooth; a loreal plate; scales smooth; head little distinct.....*Elachistodon* Rhdt.

HOMALOPSINÆ.‡

I. A grooved posterior maxillary tooth.

* Muzzle with a pair of tentacular processes.

One internasal plate; parietals undivided.....*Herpeton* Lac.

** No tentacular processes.

*a.* Scales keeled.

*β.* One internasal plate.

Parietal plates undivided.....*Homalopsis* Kuhl.

*ββ.* Two internasal plates.

Parietal plates subdivided.....*Cerberus* Cuv.

*aa.* Scales smooth.

*β.* One internasal plate.

*γ.* Gastrosteges with two keels.

Parietal plates subdivided.....*Hipistes*§ Gray.

*γγ.* Gastrosteges not keeled.

Nasal plates in contact behind rostral; eye resting on labial plates *Hypsirhina*‖ Wagl.

Nasal plates in contact; eye bounded below by scales..*Tachyplotus* Rhdt.

Nasal plates separate; eye on labials.....*Fordonia*¶ Gray.

Nasal plates separate; eye bounded with scales below..*Cantoria*** Gird.

*ββ.* Two internasal plates.

Supraorbital and posterior labial plates subdivided; two anals *Homalophis* Pet.

Nasals in contact behind rostral; parietals entire.....*Ferania*†† Gray.

Two pairs of prefrontals; nasal plates separate, undivided; eye on labials; anal double.....*Heleophis* Müller.

II. Posterior maxillary teeth not grooved.

* Scales keeled.

† Dentition diacranterian.

* *Chamætortus* Gthr.

† *Rhachiodon* Jour. *Diodon* Owen. *Anodon* Smith.

‡ Cope, Proceedings Academy Philadelphia, 1861, p. 167.

§ *Bitia* Gray.

‖ *Eurostus* D. & B. Pt. ? *Phytolopsis* Gray.

¶ *Gerarda* Gray. *Campylodon* D. & B.

** *Hydrodipsas* Peters.

†† *Trigonurus* D. & B. *Feranoides* Carlleyle.

One internasal plate; no scale-pits.....*Helicops* Wagl.
Two internasals; no scale-pits.....*Amphiësma* D. & B.
Two internasals; two scale-pits .....*Bothrodytes** Cope.

†† Dentition syncranterian or longer behind.

*a.* One internasal plate.

No scale-pits ..... *Atretium*† Cope.

*aa.* Two internasal plates.

*β.* Two nasal plates.

Anal plate divided; two scale-pits .....*Tropidonotus*‡ Kuhl
Anal plate single; no scale-pits. .....*Eutænia* B. & G

*ββ.* One nasal plate.

Anal plate single; rostral produced laterally .....*Stypocemus*§ Cope.
Anal plate divided; rostral normal.....*Amastridium* Cope.

††† Dentition isodont, or shorter behind.

*a.* Anal plate divided.

A loreal plate .....*Regina*‖ B. & G.
No loreal plate.....*Storeria*¶ B. & G.

*aa.* Anal plate entire.

*β.* Two internasals.

Head well distinguished; a loreal and preocular plates..*Atomarchus* Cope.
Head not distinct; a loreal and a preocular plate...*Tropidoclonium* Cope.
Head not distinct; a preocular; no loreal plate.....*Adelophis* Dugés.
A loreal; no preocular plate.....*Ninia*** B. & G.
A loreal and preoculars; teeth longer anteriorly....*Prymnomiodon* Cope.

*ββ.* One internasal plate.

Scales keeled; two nasals and a loreal.
*Haldea*†† B. & G.

** Scales smooth.

*a.* Dentition diacranterian.

One internasal .....*Liodytes*‡‡ Cope.

*aa.* Dentition syncranterian.

One internasal plate; anals two. .....*Limnophis* Gthr.
Two internasal plates; anals two.....*Pseudaspis*§§ Cope.

*aaa.* Dentition isodont.

Two internasals; anal entire..... *Ablabes*‖‖ D. & B.

* Gen. nov.; type *Amphiësma subminiatum* Reinwt; second species *B. tigrinus* = *A. tigrinum* Boie.

† *Tachynectes* Fitz. Cope, Proc. Acad. Phila., 1864, p. 167. *Hydræthiops* Günth. (nares superior).

‡ *Nerodia* B. & G.

§ *Chilopoma* Cope, preoccupied.

‖ *Tretanorhinus* D. & B.

¶ *Ischnognathus* D. & B.

** *Streptophorus* D. & B.

†† *Conocephalus* D. & B.

‡‡ Type *Helicops alleni* Garman.

§§ Type *Coronella cana* L.; D. & B.

‖‖ *Natrix* Gthr. *Neusterophis* Gthr. *Lycodonomorphus* Fitz. sine diagnosi; nec *Ablabes* Gthr. et auct., = *Rhadinæa*, etc.

## ACONTIOPHIDÆ.

Rostral plate deeply grooved below; nasal single; cephalic plates normal; scales smooth; body round; teeth, the posterior longest, not grooved.....*Acontiophis* Gthr.

## PROTEROGLYPHA.

### HYDROPHIDÆ.*

I. Gastrosteges wide, flat.

Two pairs of frontal shields.....*Platurus* Latr

II. Gastrosteges wide, with two keels.

Scales imbricate; one nasal.....*Aepysurus* Lacep.

Top of head scaly; two nasals.....*Pelagophis* Pet. & Dor

III. Gastrosteges narrow, rudimentary, or absent.

* Nasals separated by frontals.

Gastrosteges distinct to vent.....*Distira* Lacep

** Nasals contiguous.

Head covered with scales behind.....*Acalyptus* D. & B.

Head short, entirely shielded; no symphyseal notch....*Hydrophis* Daud.

Head moderate, entirely shielded; a deep symphyseal notch *Enhydrina* Gray.

Snout long, spatulate.....*Pelamis* Daud.

### NAJIDÆ.

I. Grooved teeth behind two perforated teeth on the os maxillare.

Head-shields normal; no loreal; scales smooth; form fusiform *Ogmodon*† Pet.

II. Solid teeth behind the fang on the os maxillare.

A. Loreal plate present.

Subcaudals entire; scales smooth.....*Denisonia* Krefft.

AA. Loreal plate absent.

*a*. The neck with few scales, not extensible.

*β*. Subcaudal scuta one-rowed.

*γ*. Scales of vertebral row equal to others.

Nasals two; scales smooth; anal bifid.....*Pseudechis* Wagl.

One nasal; scales smooth; anal single.....*Hoplocephalus*‡ Cuv.

One nasal; scales keeled; anal single.....*Tropidechis* Gthr.

*aa*. Scales of vertebral line enlarged.

Scales smooth; two nasals; anal entire.....*Bungarus* Daud.

*ββ*. Subcaudal scuta two-rowed.

* This table is mostly from Günther, Reptiles Brit. India, 355.

† *Labionaris* Brocchi.

‡ *Alecto* Wagl.

γ. Scales of vertebral row equal.

Rostral plate normal; two nasals.....*Diemenia** Gray.
Rostral plate narrow; produced backwards above; two nasals
*Pseudonaja* Gthr.
Rostral wide, prominent, depressed; one nasal.....*Furina*† D. & B.
Rostral normal; one nasal; anal double.....*Cacophis*‡ Gthr.

γγ. Scales of vertebral line enlarged.

Scales smooth.....*Megærophis*§ Gray.

*aa*. Neck extensible, covered with more numerous scales.

β. Anal entire; subcaudals two-rowed.

No postpariëtal plates.....*Naja*‖ Laur.
Postpariëtals present.....*Ophiophagus* Gthr.

III. No solid maxillary teeth.

*a*. Subcaudal scuta in two rows.

β. Rostral plate much developed.

Rostral free at the sides; scales keeled.....*Cyrtophis* Sund.
Rostral not free; scales smooth; anal entire .....*Aspidelaps* Fitz.
Rostral not free; anal entire; two nasals .....*Rhinelaps* Gthr.

ββ. Rostral not enlarged.

Scales keeled.....*Sepedon* Merr.
Scales smooth.....*Callophis* Gr.

*aa*. Subcaudal scutella in one row.

One nasal; a spine at end of tail.....*Acanthophis* Daud.

## ELAPIDÆ.

*a*. Internasal plate touching the nasal laterally.

One nasal plate .....*Vermicella*¶ Gray.
Two nasal plates .....*Elaps* Schn.

*aa*. Internasal reaching first labial plate.

One nasal; no loreal.....*Microsoma* Jan.

## DENDRASPIDIDÆ.

No solid teeth behind fang; anal and subcaudal plates divided; scales smooth.....*Dendraspis*** Schl.

## SOLENOGLYPHA.

## CAUSIDÆ.

Subcaudals double, anal entire; scales keeled; rostral prominent, with recurved border.....*Heterophis* Pet.

**Pseudoelaps* D. & B. *Elapsoidea* Bocage. *Hemibungarus* Pet.; includes *Brachysoma triste* Gthr.

† *Brachyurophis* Gthr.

‡ *Brachysoma* Gthr. *Boulengerina* Dollo.

§ *Xenurelaps* Gthr.

‖ *Tomyris* Eichw.

¶ *Homorelaps* Jan. *Poecilophis* Gthr.

** *Dinophis* Hallow.

Subcaudal and anal plates double; scales keeled; rostral normal
*Causus* Wagl.
Subcaudals and anal entire; scales smooth; rostral normal; a loreal
*Dinodipsas* Pet.

ATRACTASPIDIDÆ.

Head not distinct; two nasals; a loreal; scales smooth; subcaudals entire
*Atractaspis* Smith.

VIPERIDÆ.

I. Urosteges two-rowed.
Nostril between two plates.....*Vipera** Laur.
"Nostril between three plates" (Gthr.).....*Daboia* Gray.
Nostril surrounded by scales and a nasal; horn-like supraocular scales
*Cerastes* Wagl.
Nostril surrounded by scales and a supranasal; no supraocular nor nasal horns.....*Bitis*† Gray.
Nostril surrounded by scales and a supranasal; horn-like scales above latter; no supraocular horns .....*Clotho* Gray.
II. Urosteges one-rowed.
Body and tail cylindric.....*Echis*‡ Merr.
Body and tail compressed and prehensile.....*Atheris*§ Cope.

CROTALIDÆ.

I. No rattle.
β. Urosteges two-rowed.
Top of head scaled; urosteges four-rowed at end; a caudal spine
*Lachesis* Wagl.
Top of head with small scales; tail normal.....*Bothrops*‖ Wagl.
Top of head with large imbricate shield-like scales.....*Peltopelor* Gthr.
Top of muzzle scaled; rest of head shielded.....*Hypnale* Cope.
Top of head with nine shields; scales carinate....*Trigonocephalus* Oppel.
Top of head with nine shields; scales smooth.....*Calloselasma*¶ Cope.
β,β. Urosteges one-rowed.
Body and tail cylindric, not prehensile; head scaly.....*Bothriopsis* Pet.
Body and tail compressed, prehensile; head scaly, scales normal
*Bothriechis* Pet.
Body and tail compressed, prehensile; head scaly; a row of scales outside the superciliary shield.....*Teleuraspis* Cope.

**Pelias* Wagl.
† *Echidna* Wagl. not Forster.
‡ *Toxicoa* Gray.
§ *Pœcilostolus* Gthr.
‖ *Trimesurus* Gray, Gthr., Peters. *Tropidolæmus* Wagler. *Megæra* Gray. *Atropos* Wagl.
¶ *Leiolepis* D. & B. nec Cuv.

Body and tail not prehensile; nine normal head-shields.
*Ancistrodon** Beauv.

II. A rattle.
Head with nine scuta above. ..... *Crotalophorus*† Gray.
Head with scales above..... *Crotalus*‡ Linn.

## SYNOPSIS OF THE GENERA.

| | | | |
|---|---|---|---|
| Typhlopidæ | 6 | Colubridæ (*continued*)— | |
| Stenostomidæ | 2 | Psammophidæ | 3 |
| Tortricidæ | 2 | Lycodontinæ | 17 |
| Rhinophidæ | 7 | Leptognathinæ | 7 |
| Xenopeltidæ | 1 | Dipsadinæ | 7 |
| Pythonidæ | 8 | Dasypeltinæ | 2 |
| Boidæ | 16 | Homalopsinæ | 30 |
| Charinidæ | 1 | Acontiophidæ | 1 |
| Acrochordidæ | 2 | Hydrophidæ | 8 |
| Nothopidæ | 2 | Najidæ | 19 |
| Colubridæ— | | Elapidæ | 3 |
| Calamarinæ | 58 | Dendraspididæ | 1 |
| Coronellinæ | 23 | Causidæ | 3 |
| Scytalinæ | 18 | Atractaspididæ | 1 |
| Colubrinæ | 36 | Viperidæ | 7 |
| Philodryadinæ | 9 | Crotalidæ | 12 |
| Dryophidinæ | 7 | Total | 317 |

A number of generic names have been given by authors with definitions which do not refer to the dentition. On this account I have been unable to include them in the above tables. I have credited generic names to authors who have published the first description, and not to those who have given them as *nomina nuda*.

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## ERRATA AND ADDENDA.

Page 486, middle, line $\delta$, omit word "below."

Page 486, below middle, line $\delta\delta$, for "first labial" read "internasals."

Page 487, under CORONELLINÆ, immediately below line $\varepsilon$, insert a line, viz: Two scale-pits; rostral not produced..... *Proterodon* Hallow.

Page 489, in character of genus *Trimerorhinus*, for "scale pores" read "scale-pits."

Page 490, above middle, immediately below line $\varepsilon$, insert a line, viz: Form robust; tail moderate; no scale-pits..... *Grayia* Gthr.; also add the words "two scale-pits" to the characters of the following genera—Coluber and Drymobius; also remove synonymy of Coluber in note ‡, excepting "*Calopeltis* Bp.," and place it to the synonymy of *Grayia*.

* *Cenchris* Daud.

† *Caudisona* Fitz, Wagl. *Systrurus* Garman.

‡ *Caudisona* Laur. *Crotalophorus* Linn., pt., *Uropsophus* Wagl.

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*Subjective After-Color (Complementary Color). By Charles A. Oliver, M.D.*

*(Read before the American Philosophical Society, October 1, 1886.)*

Last year the writer brought forward, in "The American Journal of the Medical Sciences," a series of papers upon "A Correlation Theory of Color-Perception," in which this subject was exhaustively treated both from theoretical grounds and experimental standpoint. In a desire to isolate a few special data upon "Complementary Color," and to place them upon record, he has separated this part of the paper, and abridged it into a series of definite formulæ, which are here presented to the Society. Before arranging any conclusions, a brief synopsis of the theory will be given, so as to allow a correct understanding of the basis upon which they are placed. Starting with the assumption that all natural imponderable stimuli are the resultants of a mere difference in the number of vibrations of one and the same ether, and that the organs for the receipt of the different varieties must be but analogues and modifications of each other, it was shown by comparison with the senses of touch and hearing that the usually received theories of color-perception are incorrect. The question was then asked, Why take the trouble to give a series of organic elements, a coarse, unnatural division of fibre in an effort to harmonize them with an arbitrary and unscientific naming of visible color, when we have the difference of result dependent upon a difference in cause acting upon an ever-ready material?—a difference in the character of natural impression affecting one and the same organic element to a greater or less degree, producing exact and equivalent answers. It was then shown that each and every optic-nerve fibre tip has a passive receiving power equal to its individual strength; that each and every healthy optic-nerve filament transmits to the color-centre for recognition, nerve-energies equal to as many special sensations as its peripheral tip is capable of receiving; and that the innumerable quantities of nerve filaments, placed side by side on a sheet or membrane, serve to give greater field, and to allow many colors to be seen at one time, thus making our every-day and momentary pictures. These assertions brought forward the following theory. Color-perception takes place through each and every optic-nerve filament. It consists in the passive separation of a specific nerve-energy equal to the exposed natural color, from a supposed "energy-equivalent," resident in the peripheral nerve tip, by an active chemico-vital process of the impinging natural color-vibration upon the sensitized nerve terminal. The separated nerve energy is transmitted to the central terminus of the filament in the cerebral retina, where it is fully evolved into such a condition as to be transformed into an automatic and, finally, an intelligent perception. The moment that the primary portion of this action (*i. e.*, the separation) has taken place, there has been left in the peripheral tip of the primarily impinged sensory filament, a nerve-energy material equal to the difference between that individual nerve's "energy-equivalent"

and the transmitted nerve stimulus; the healthy peripheral nerve tip returning to its "energy-equivalent" or normal nerve power, the moment that the specific energy separated by the received natural vibration has been forwarded for transmission and recognition, whilst the transmitting filament and excited cerebral expansion regain their normal conditions the moment that the energy has passed them. After the consummation of such an action, the filament is again ready for any other natural color-vibration. In other words, a natural wave motion equal to natural color sets a peripherally placed life force into an equivalent life motion, which is transmitted to a central organ of perception where it is perceived. It is the action of natural wave motion upon sensory life motion, the life motion being produced by a loss and restitution of working material, *i. e.*, a chemico-vital action. Thus to see red, the nerve is first supposed to be charged to its normal physiological condition by its inherent vitality and sensitizing material. Vibrations of say five hundred trillions per second (some natural red color), are allowed to be thrown upon this sensitized tip. To see the color, the peripheral negative (an unused energy equal to the commencing sensation of a "green") must be allowed to rest, by the separation of a quantity of nerve-force equal to a supposed red energy, from the "energy-equivalent," through the excitation of the impinging ray. This separated specific energy is transmitted and perceived. The moment that the red-energy has left the nerve tip, the terminal is again charged to its "energy-equivalent" and is ready to receive any other color-vibration that may be cast upon its surface. Each and every natural color causes the separation of a specific energy equal to itself, which is properly transmitted and correctly perceived, if the conducting and central nerve structures be normal and intact.

Based upon this theory, the following conclusions in reference to subjective after-color may be formulated:

*First. Definition of Subjective After-Color.*—Color-perception resulting directly from provoked remaining nerve-energies. The exciting stimulus may be either peripheral or central; the former is produced from the external world or natural light stimulus, and the latter from some internal stimulation, either in the visual apparatus or in the cerebrum beyond it.

*Second. Cause of Subjective After-Color.*—"Complementary Color" is caused by the presentation of a second stimulus, either external or internal, of greater power than the remaining nerve-energy left from a previous color-action, before the visual apparatus has had time to return to its normal condition.

*Third. Equivalence of Result.*—The result is always equal to the difference between the amount of nerve-energy separated by the primary stimulus and the normal condition (energy equivalent) of the impressed portion of the optic-nerve filament.

*Fourth. Passing Subjective After-Colors.*—Two varieties; non-reëxposed and reëxposed. The former depends upon the fact that the primary stim-

ulation has been of such great intensity that it has left an irritant action which separates specific nerve-energies from the reforming material as fast as it is poured into the exhausted nerve; this, coupled with the fact that the irritant action is ever decreasing, with a proportionate gain of nerve-energy material, is the cause of the succession of subjective after-colors. The latter variety has the same character of passing subjective after-color, except that here they progress in a *reverse* order. This is readily explained. During the time that the re-impressed tip is gradually gaining sufficient nerve-energy to transmit the second natural white stimulus, there is a corresponding separating process continually taking place, dependent upon the great intensity of the second natural white stimulus. These separated amounts of nerve-energy are forwarded to the perceptive centres where they are recognized. This continues in a definite order of gain until at last the second natural white stimulus is able to be properly received, which is transmitted and perceived as "white."

*Fifth. Transferred Subjective After-Color.*—This is dependent upon a transformation of a "remaining energy" of one of the primarily used perceptive color-cells belonging to a strongly impressed visual apparatus, to an equivalently placed perceptive color-cell belonging to a weakly impressed visual apparatus, due probably to the fact that at the time of the double action, the perceptive cells of each channel are physically and physiologically thrown into connection with each other. That there is an organic or life connection at such times is known by the blending of the finite results.

*Sixth. Simultaneous Contrast-Colors.*—These show that either the action of simultaneously powerful and feeble intensities of natural color stimuli, or of a prolonged exposure of a strong and a weak natural color impression upon a series of contiguous peripheral nerve terminals of the same visual apparatus, can readily provoke an internal irritant action in the strongly excited perceptive color-cell, which will, in its turn, cast the entire brunt of its remaining nerve-force upon its feebly excited neighbor, and thus rouse the now secondarily impinged cell into a corresponding action.

*Seventh. Alternating Subjective After-Colors.*—These are dependent upon momentary alternating regains and discharges of sufficient energy material to perceive color-energies, equal to, first, the primary energy, and then its subjective after-color, after having perceived the subjective after-color.

*Eighth. Other Varieties.*—These are produced by modifications of the just-described exciting agencies and conditions of physical material.

## *On the Ikonomatic Method of Phonetic Writing, with Special Reference to American Archæology. By Daniel G. Brinton, M.D.*

*(Read before the American Philosophical Society, October 1, 1886.)*

All methods of recording ideas have been divided into two classes, Thought Writing and Sound Writing.

The first, simplest and oldest is Thought Writing. This in turn is subdivided into two forms, Ikonographic and Symbolic Writing. The former is also known as Imitative, Representative or Picture Writing. The object to be held in memory is represented by its picture, drawn with such skill, or lack of skill, as the writer may possess. In Symbolic Writing, a single characteristic part or trait serves to represent the whole object; thus, the track of an animal will stand for the animal itself; a representation of the peculiar round impression of the wolf's foot, or the three-lined track of the wild turkey, being amply sufficient to designate those creatures. Even the rudest savages practice both these forms of writing, and make use of them to scratch on rocks, and paint on bark and hides, the record of their deeds.

It will be observed that Thought Writing has no reference to spoken language; neither the picture of a wolf, nor the representation of his footprint, conveys the slightest notion of the sound of the word *wolf*. How was the enormous leap made from the thought to the sound, in other words, from an ideographic to a phonetic method of writing?

This question has received considerable attention from scholars with reference to the development of the two most important alphabets of the world, the Egyptian and the Chinese. Both these began as simple picture writing, and both progressed to almost complete phoneticism. In both cases, however, the earliest steps are lost, and can be retraced only by indications remaining after a high degree of phonetic power had been reached. On the other hand, in the Mexican and probably in the Maya hieroglyphics, we find a method of writing which is intermediate between the two great classes I have mentioned, and which illustrates in a striking manner the phases through which both the

Egyptian and Sinitic alphabets passed somewhat before the dawn of history.

To this method, which stands midway between the ikonographic and the alphabetic methods of writing, I have given the name *ikonomatic*, derived from the Greek εικων-ονος, an image, a figure; ονοματος, a name. That which the figure or picture refers to is not the object represented, but the *name* of that object—a *sound*, not a *thing*. But it does not refer to that sound as the name of the object, but precisely the contrary—it is the sound of the name of some other object or idea. Many ideas have no objective representation, and others are much more simply expressed by the use of figures whose names are familiar and of similar sound. Thus, to give a simple example, the infinitive "to hide" could be written by a figure 2, and the picture of a skin or hide. It is this plan on which those familiar puzzles are constructed which are called *rebuses*, and none other than this which served to bridge over the wide gap between Thought and Sound writing. It is, however, not correct to say that it is a writing by *things* "*rebus*;" but it is by the *names* of things, and hence I have coined the word *ikonomatic*, to express this clearly.

I shall select several illustrations from two widely diverse sources, the one the hieroglyphs of Egypt, the other the heraldry of the Middle Ages, and from these more familiar fields obtain some hints of service in unraveling the intricacies of the Mexican and Maya scrolls.

The general principle which underlies "ikonomatic writing" is the presence in a language of words of different meaning but with the same or similar sounds; that is, of *homophonous* words. The figure which represents one of these is used phonetically to signify the other. There are homophones in all languages; but they abound in some more than in others. For obvious reasons, they are more abundant in languages which tend toward monosyllabism, such as the Chinese and the Maya, and in a lesser degree the ancient Coptic. In these it is no uncommon occurrence to find four or five quite different meanings to the same word; that is, the same sound has served as the radical for that many different names of diverse objects. The picture of any one of these objects would, to the speaker of the language, recall a sound which would have all these significations, and could be

employed indifferently for any of them. This circle of meanings would be still more widely extended when mere similarity, not strict identity, was aimed at.

Such was plainly the origin of phoneticism in the Egyptian hieroglyphic inscriptions. Take the word *nefer*. Its most common concrete signification was "a lute," and in the picture writing proper the lute is represented by its figure. But *nefer* had several other significations in Coptic. It meant, a *colt*, a *conscript soldier*, a *door*, and the adjective *good*. The picture of the lute therefore was used to signify every one of these.

It will be observed that this is an example of a pure ikonograph. The picture is that of the object in full, a lute; but precisely in the same way the second class of figures in picture writing, those which are wholly symbolic, may be employed. This, too, finds ample illustration in the Egyptian hieroglyphics. Instead of the picture of a house, the figure of a square was employed, with one side incomplete. Phonetically, this conveyed the sound *per*, which means *house*, and several other things.

It will readily be seen that where a figure represents a number of homophonous words, considerable confusion may result from the difficulty of ascertaining which of these is intended. To meet this, we find both in Egyptian and Chinese writing series of signs which are written but not pronounced, called "determinatives." These indicate the class to which a word has reference. They are ideographic, and of fixed meaning. Thus, after the word *nefer*, when used for conscript, the determinative is the picture of a man, etc.*

There is little doubt but that all the Egyptian syllabic and alphabetic writing was derived from this early phase, where the governing principle was that of the rebus. At the date of the earliest inscriptions, most of the phonetics were monosyllabic; but in several instances, as *nefer*, above given, *neter*, which represents a banner, and by homophony, a god, and others, the full dissyllabic name was preserved to the latest times. The

* The following elements occur in the old Egyptian writing:
1. Ideographic.—(*a*) Pictures or ikonographs.
(*b*) Symbols.
(*c*) Determinatives.
2. Phonetic.—(*a*) Words.
(*b*) Syllables.
(*c*) Letters.

monosyllabic signs were derived from the initial and the accented syllables of the homophones; and the alphabet, so-called, but never recognized as such, by the Egyptians, either from monoliteral words, or from initial sounds. At no period of ancient Egyptian history was one sound constantly represented by one sign. In the so-called Egyptian alphabet, there are four quite different signs for the *M*, four for the *T*, three for the *N*, and so on. This is obviously owing to the independent derivation of these phonetic elements from different figures employed ikonomatically.

There are other peculiarities in the Egyptian script, which are to be explained by the same historic reason. For instance, certain phonetic signs can be used only in definite combinations; others must be assigned fixed positions, as at the beginning or at the end of a group; and, in other cases, two or more different signs, with the same phonetic value, follow one another, the scribe thinking that if the reader was not acquainted with one, he would be with the other. I note these peculiarities, because they may be expected to recur in other systems of ikonomatic writing, and may serve as hints in interpreting them.

Evidently, one of the earliest stimuli to the development of phonetics was the wish to record proper names, which in themselves had no definite signification, such as those drawn from a foreign language, or those which had lost through time their original sense. In savage conditions every proper name is significant; but in conditions of social life, as developed as that of the Egyptians of the earliest dynasties, and as that of the Mayas and Mexicans in the New World, there are found many names without meaning in the current tongue. These could not be represented by any mode of picture writing. To be recorded at all, they must be written phonetically; and to accomplish this the most obvious plan was to select objects whose names had a similar sound, and by portraying the latter, represent to the ear the former. The Greek names, *Alexander* and *Alexandria*, occurring on the Rosetta Stone, were wholly meaningless to the Egyptian ear; but their scribes succeeded in expressing them very nearly by a series of signs which in origin are rebuses.

This inception of the ikonomatic method, in the effort to express phonetically proper names, is admirably illustrated in mediæval heraldry. Very early in the history of armorial bear-

ings, we find a class of scutal devices called in Latin *arma cantantia*, in English *canting arms*, in French *armes parlantes*. The English term *canting* is from the Latin *cantare*, in its later sense of *chanting* or *announcing*. Armorial bearings of this character present charges, the names of which resemble more or less closely in sound the proper names of the family who carry them.

Some writers on heraldry have asserted that bearings of this character should be considered as what are known as *assumptive arms*, those which have been *assumed* by families, without just title. Excellent authorities, however, such as Woodham and Lower, have shown that these devices were frequent in the remotest ages of heraldry.* For instance, in the earliest English Roll of Arms extant, recorded in the reign of the third Henry, about the year 1240, nine such charges occur, and still more in the Rolls of the time of Edward the Second. They are also abundant in the heraldry of Spain, of Italy and of Sweden; and analogous examples have been adduced from ancient Rome. In fact, the plan is so obvious that instances could be adduced from every quarter of the globe. In later centuries, such punning allusions to proper names became unpopular in heraldry, and are now considered in bad taste.

To illustrate their character, I will mention a few which are of ancient date. The well-known English family of *Dobells* carry a *hart passant*, and three bells *argent*, thus expressing very accurately their name, *doe-bells*. The equally ancient family of Boltons carry a device representing a cask or *tun*, transfixed by a crossbow or *bolt*. Few canting arms, however, are so perfect as these. The Swinburnes, who are among those mentioned on the Roll of 1240, already referred to, bear three boar-heads, symbolical of *swine;* the Boleynes carry three bulls' heads, which reminds us of Cardinal Wolsey's pronunciation of the name in Shakespeare's Henry VIII, *Bullen:*

> "Anne Bullen? No; I'll no Anne Bullens for him:
> There's more in't than fair visage.—Bullen!
> No, we'll no Bullens."—*King Henry VIII, Act iii.*

Not rarely the antiquity of such bearings is evidenced by the

*See M. A. Lower, *Curiosities of Heraldry*, Chap. vi (London, 1845). An appropriate motto of one of these bearings was: "Non verbis sed *rebus* loquimur."

loss of the allusion in the current language, and recourse must be had to ancient and obsolete words to appreciate it. The English Harrisons display in their shield a hedgehog, which is to be explained by the French *hérisson*, and testifies to their Norman origin. The Sykes of the north of England show a fountain in their shield, whose significance is first ascertained on learning that in the Northumbrian dialect *syke* means a flowing spring or stream. The celebrated *fleurs-de-lys* of the royal house of France are traced back to the first Louis, whose name was pronounced *Loys*, and from the similarity of this to the common name of the flower, the latter was adopted as the charge on his shield.

Hundreds of such examples could be adduced, and the task of examining and analyzing them would not be an altogether vain one, as the principles upon which they were applied are the same which control the development of ikonomatic writing wherever we find it. But I pass from the consideration of these facts of general knowledge to the less known and much misunderstood forms of this writing which are presented in American archæology.

These are best exemplified in the so-called Mexican picture writing. For many years scholars have been divided in opinion whether this was purely ikonographic or partly phonetic. About forty years ago M. Aubin wrote an essay maintaining that it is chiefly phonetic, and laid down rules for its interpretation on this theory. But neither he nor any who undertook to apply his teachings succeeded in offering any acceptable renderings of the Aztec Codices. I am persuaded, however, that the cause of this failure lay, not in the theory of Aubin, but in the two facts, first, that not one of the students who approached this subject was well grounded in the Nahuatl language; and, secondly, that the principles of the interpretation of ikonomatic writing have never been carefully defined, and are extremely difficult, ambiguous and obscure, enough so to discourage any one not specially gifted in the solution of enigmas. At first, every identification is as puzzling as the effort to decipher an artificial rebus.

There are, indeed, some able scholars who still deny that any such phoneticism is to be found in Mexican pictography. To convince such of their error, and to illustrate the methods em-

ployed by these native American scribes, I will present and analyze several typical examples from Aztec manuscripts.

Beginning with proper names drawn from other languages, we find that the Nahuas had a number of such, which, of course, had no meaning in their own tongue. One of their documents speaks of the town of the Huastecas, called by that tribe *Tamuch*, which means in their tongue "near the scorpions," and by the Aztecs, in imitation, *Tamuoc*.* As the Huasteca is a Maya dialect, totally distinct from the Nahuatl, this word had no sense to the ears of the Aztecs. To convey its sound, they portrayed a man holding in his hands a measuring stick, and in the act of measuring. Now, in Nahuatl, the verb "to measure" is *tamachiua*; the measuring stick is *octocatl*; and, to make the latter plainer, several foot-prints, *xoctli*, are painted upon the measuring stick, giving an example of the repetition of the sound, such as we have already seen was common among the Egyptian scribes.

FIG. 1.—Tamuoc.

In another class of proper names, in their own tongue, although they had a meaning in the Nahuatl, the scribe preferred to express them by ikonomatic instead of ikonographic devices. Thus, *Mapachtepec*, means, literally, "badger hill," or "badger town," but in place of depicting a badger, the native writer made a drawing of a hand grasping a bunch of Spanish moss, the *Tillandsia usneoides*. The hand or arm in Nahuatl is *maitl*, the moss *pachtli*; and taking the first syllables of these two words we obtain *ma pach*: the word *tepec*, locative form of *tepetl*, hill or village, is expressed by the usual conventional ideographic or determinative sign.

FIG. 2.—Mapachtepec.

In other names, the relative *position* of the objects are significant, reminding us of the rebus of a well known town in Massachusetts, celebrated for its educational institutions:

&

Mass.

* *Tam*, near; *uch*, scorpion. *Diccionario Huasteca-Español*, MS., in my possession. This and most of the other instances quoted are to be found in Lord Kingsborough's great work on Mexico, and also in Dr. Peñafiel's *Catálogo Alfabetico de los Nombres de Lugares pertenecientes al Idioma Nahuatl* (Mexico, 1885).

which is to be read, "Andover, Massachusetts," so in the Aztec scrolls, we have *itzmiquilpan* represented by an obsidian knife, *itztli*, and an edible plant, *quilitl*, which are placed above or over (*pan*), the sign for cultivated land, *milli*, thus giving all the elements of the name, the last syllable by position only.

FIG. 3.—Itzmiquilpan.

In one respect I believe the ikonomatic writing of the Mexicans is peculiar; that is, in the phonetic value which it assigns to *colors*. Like the Egyptian, it is polychromatic, but, so far as I know, the Egyptian polychromes never had a phonetic value; they were, in a general way, used by that people as determinatives, from some supposed similarity of hue; thus green indicates a vegetable substance or bronze, yellow, certain woods and some animals, and so on. In heraldry the colors are very important and have well-defined significations, but very seldom, if ever, phonetic ones. Quite the contrary is the case with the Mexican script. It presents abundant instances where the color of the object as portrayed is an integral phonetic element of the sound designed to be conveyed.

To quote examples, the Nahuatl word for yellow is *cuztic* or *coztic*, and when the hieroglyphics express phonetically such proper names as *Acozpa*, *Cozamaloapan*, *Cozhuipilcan*, etc., the monosyllable *coz* is expressed solely by the yellow color which the scribe lays upon his picture. Again, the name *Xiuhuacan*, "the place of grass," is represented by a circle colored pale blue, *hxiutic*. The name of this tint supplies the phonetic desired. The name of the village *Tlapan* is conveyed by a circle, whose interior is painted red, *tlapalli*, containing the mark of a human foot-print. Such examples are sufficient to prove that in undertaking to decipher the Mexican writing we must regard the color as well as the figure, and be prepared to allow to each a definite phonetic value.

FIG. 4.—Acozpa.

It must not be understood that all the Aztec writing is made up of phonetic symbols. This is far from being the case. We discover among the hundreds of curious figures which it pre-

sents, determinatives, as in the Egyptian inscriptions, and numerous ideograms. Sometimes the ideogram is associated with the phonetic symbol, acting as a sort of determinative to the latter. An interesting example of this is given at the beginning of the "Manuscripto Hieratico," recently published by the Spanish government * It is the more valuable as an example, as the picture writing is translated into Nahuatl and written in Spanish

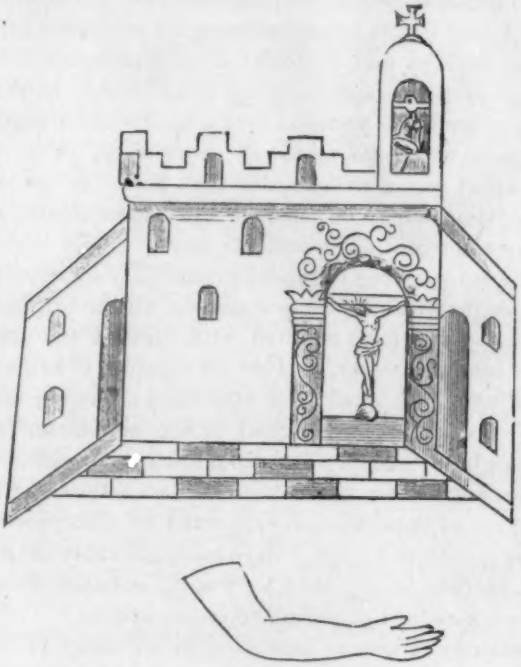

FIG. 5.—Tlamapa.

characters. The date of the document, 1526, leaves no doubt that it is in the same style as the ancient Codices. The page is headed with the picture of a church edifice; underneath is the outline of a human arm, and the legend in Nahuatl is:

*In Altepetl y Santa Cruz Tlamapa.*

These words mean, "the town of Santa Cruz Tlamapa." The name "*tlamapa*" means "on the hillside," and doubtless originally

* It is given in the appendix to the *Ensayo sobre la Interpretacion de la Escritura Hieratica de la America Central*, by De Rosny, translated by D. Juan de Dios de la Rada y Delgada (Madrid, 1881).

referred to the position in which the village was situated. But the prefix "*tlama*" usually signifies, "to do something with the arms or hands," derived from *maitl*, hand or arm. Hence, the figure of the extended arm gives this dissyllable, *tlama*, which was sufficient to recall the name of the town.

The Aztecs by no means confined the ikonomatic system to proper names. They composed in it words, sentences, and treatises on various subjects. In proportion as it is applied to these connected and lengthy compositions, its processes become more recondite, curious and difficult of interpretation. Without a knowledge of the spoken language considerably more than rudimentary, it would be hopeless for the student to attempt to solve the enigmas which he meets at every step. Yet every well-directed effort will convince him that he is on the right track, and he will constantly be cheered and stimulated to further endeavor by the victories he will win day by day.

Few indeed have the requisite preliminary knowledge and the gift of insight into verbal puzzles to attain brilliant success. Among those who have pursued with marked and gratifying results this intricate study, it gives me pleasure to name Mrs. Zelia Nuttall Pinart. This lady has unraveled a number of the pages of the Vienna Codex and several of the monolithic inscriptions which have been handed down from ancient Mexico. With commendable caution she has refrained from publishing her results until they could be presented, supported by such proofs that they cannot be questioned; but, from a personal examination of them, I do not hesitate to say that they will be found to come up to the highest standard of scientific requirements.*

The analogy which is presented in so many particulars between Mexican and Maya civilization would lead us to infer that the Maya writing, of which we have a number of examples well preserved, should be unlocked by the same key which has been successfully applied to the Aztec Codices. The latest writers on the Maya manuscripts, while agreeing that they are in part, at least, in phonetic characters, consider them mostly ideographic. But it is to be noted that not one of these writers has any practical acquaintance with the sounds of the Maya language, and

*Several of Mrs. Pinart's interpretations were exhibited to the Anthropological Section of the American Association for the Advancement of Science at its last meeting (Buffalo, 1886), and were favorably received by the members.

scarcely any with its vocabulary. From this it is evident that even were these codices in ikonomatic writing, such investigators could make very little progress in deciphering them, and might readily come to the conclusion that the figures are not phonetic in any sense. Precisely the same position was taken by a number of students of Egyptian antiquity long after the announcement of the discovery of Champollion; and even within a few years works have been printed denying all phoneticism to the Nilotic inscriptions.

What induces me to believe that much of the Maya script is of the nature of the Mexican is the endeavor, undertaken for a very different purpose, of Professor Valentini to explain the origin of the so-called Maya alphabet, preserved by Bishop Landa, and printed in the editions of his celebrated "Description of Yucatan."* Professor Valentini shows by arguments and illustrations, which I think are in the main correct, that when the natives were asked to represent the sounds of the Spanish letters in their method of writing, they selected objects to depict, whose names, or initial sounds, or first syllables, were the same, or akin, to the sounds of the Spanish vowel or consonant heard by them. Sometimes they would give several words, with their corresponding pictures, for the same sound; just as I have shown was the custom of the ancient Egyptians. Thus, for the sound *b* they drew a foot-print, which in their tongue was called *be;* for the sound *a* an obsidian knife, in Maya, *ach*, etc. Valentini thinks also that the letter *E* was delineated by black spots, in Maya *eek*, meaning black, which, if proved by further research, would show that the Mayas, like the Mexicans, attributed phonetic values to the colors they employed in their painted scrolls.

Outside of the two nations mentioned, the natives of the American continent made little advance toward a phonetic system. We have no positive evidence that even the cultivated Tarascas and Zapotecs had anything better than ikonographs; and of the Quiches and Cakchiquels, both near relatives of the Mayas, we only know that they had a written literature of considerable ex-

* Valentini's Essay appeared in the *Proceedings of the American Antiquarian Society*, April, 1880. Landa's work was originally published by the Abbe Brasseur (de Bourbourg) at Paris, 1864, and more accurately at Madrid, 1884, under the supervision of Don Juan de Dios de la Rada y Delgada.

tent, but of the plan by which it was preserved we have only obscure hints. Next to these we should probably place the Chipeway pictography, as preserved on their *meda* sticks, bark records, and *adjidjiatig* or grave-posts. I have examined a number of specimens of these, but have failed to find any evidence that the characters refer to sounds in the language; however, I should not consider it improbable that further researches should disclose some germs of the ikonomatic method of writing even in these primitive examples of the desire of the human intellect to perpetuate its aquisitions, and hand them down to generations yet unborn.

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*Synonymic List of the North American species of Bufo and Rana, with descriptions of some new species of Batrachia, from specimens in the National Museum. By E. D. Cope.*

(*Read before the American Philosophical Society, October 1, 1886.*)

BUFO Laur.

BUFO PUNCTATUS Baird & Girard, Proceedings Academy Philadelphia, 1852, p. 173. *Bufo beldingii* Yarrow, Proceedings U. S. National Museum, 1882, p. 441.
Sonoran and Lower Californian regions.

BUFO DEBILIS Girard, Proceedings Acad. Philadelphia 1854, p. 87. *Bufo insidior* Girard, Proceedings Academy Philadelphia, 1854, p. 88.
Sonoran region.

BUFO COLUMBIENSIS Baird & Girard, Proc. Ac. Phila., 1853, p. 378. *Bufo boreas* Baird & Girard, Proc. Ac. Phila., 1852, p. 174. *Bufo halophila* Baird & Girard, Proc. Ac. Phila., 1853, p. 301. *Bufo chilensis*, part, Günth., Cat. Batr. Sal. Brit. Mus., 1868, p. 57. *Bufo microscaphus* Cope, Proc. Ac. Phila., 1866, p. 301. *Bufo pictus* Cope, Report U. S. G. G. Expl. W. of 100th Mer., v, p. 522, pl. xxv, f. 4–5.
Pacific region; Western Central region.

BUFO COMPACTILIS Wiegm., Isis, 1833, p. 661. *Anaxyrus melancholicus* Tschudi, Faun. Per. Herp., p. 78, pl. ii, f. 5. *Bufo speciosus* Girard, Proc. Ac. Phila., 1854, p. 86. *Bufo anomalus* Günth., Cat. Batr. Salien. Brit. Mus., 1868, p. 57. *Bufo levifrons* Bocourt, Bull. Soc. Philom. (7), i, p. 187. *Dromoplectrus anomalus* Camerano, Atti. Acc. Tor., xiv, p. 882.
Mexican district; Texas.

BUFO ALVARIUS Girard, Baird's Reptilia, U. S. Mexican Boundary Survey. ii, p. 26, pl. xii, f. 1–6.
Colorado Desert.

BUFO HEMIOPHRYS Cope.

Superciliary crests not distinct on the muzzle, parallel, nearly straight, terminating abruptly posteriorly in a transverse elevation. The latter meet on the middle line, forming a transverse ridge, with an abrupt descent to the nape. Externally they extend but a short distance, leaving no representatives of the postorbital ridges except a few tubercles in one or two of the specimens. A small supratympanic tuberosity No preorbital ridge. Muzzle vertical at end, nostrils terminal. Membranum tympani a vertical oval, two-thirds the diameter of the eye. Parotoid gland a narrow oval. Dermal tubercles distinguished by their small size and prominence. They form several rows on the back and external face of the tibia. At all other points the skin is closely areolated, the areolæ frequently acutely prominent, especially on the superior face of the tibia and on the sides. The heel of the extended hind leg reaches to the posterior border of the orbit. The posterior foot is wider than in the *B. lentiginosus*, though not relatively shorter. The web is excavated to the line of the middle of the fourth (first) phalange. The metatarsal tubercles are especially large. The internal is very wide and prominent, and has an extensive acute edge; the external is much smaller, but it also has a free cutting edge, transverse to the length of the tarsus. The length of the head to the position of the postorbital crests, enters the total (to the vent) four and a half times.

The color is brown, marked on the back with a median yellowish line, and two or three rows of brown spots of medium size on each side of it. These spots have one or two tubercles for their center pieces, which are more reddish than the rest of the spot. There are two brown spots on the upper lip, and one below the tympanum. A large spot extends from below the parotoid gland to near the front of the humerus. Posterior to this, with a slight interval, there extends a longitudinal deep brown band, which extends, with interruptions, to the groin. Below this, on the sides, are other dark-brown bands, which form a more or less reticulate pattern. The limbs and posterior feet have dark-brown cross-bands, and there is a very coarse dark brown reticulation of brown or brownish yellow on the posterior face of the femur. The belly is more or less black-spotted; throat immaculate.

| *Measurements* (*No. 11,927*). | M. |
|---|---|
| Length of head and body | .059 |
| " " " to posterior edge of m. tympani | .015 |
| Width " " at anterior " " | .023 |
| Length of anterior limb | .034 |
| " " " foot | .014 |
| " " posterior limb | .068 |
| " " tibia | .020 |
| " " tarsus | .010 |
| " " rest of foot | .025 |

Besides the peculiarities of the head crests, and metatarsal shovels, this

species differs from most of the other North American species in having no postorbital crests, and in having the belly spotted. From the *B. lentiginosus fowleri* it differs also in the development of the external metatarsal tubercle, and in the connection between the frontoparietal crests behind.

No. 11,927. Six specimens from the northern boundary of Montana. Collected by Dr. Elliott Coues.

BUFO COGNATUS Say, Long's Expedition to the Rocky Mountains, ii, 1823, p. 190. *Bufo dipternus* Cope, American Naturalist, xiii, p. 437.
Eastern half of Central region.

BUFO LENTIGINOSUS Shaw, Zoölogy, 1803, iii, i, p. 173, tab. 2111.
Eastern and Central regions.

B. L. FOWLERI Putnam, MSS. Cope Check List North American Batr. and Reptilia, 1875, p. 29 (name only).
Canadian and Hudsonian districts of Eastern region.

B. L. WOODHOUSEI Girard. *Bufo woodhousei* Girard, Proc. Ac. Phila., 1854, p. 86; Baird, U. S. Pacific R. R. Reports, x, p, 44. pl. xxv, f. 1. *Bufo frontosus* Cope, Proc. Ac. Phila., 1866, p. 301; Rept. Expl. U. S. Surv. W. of 100th Mer., Capt. G. M. Wheeler, 1877, v, pp. 520, 627.
Central region.

B. L. AMERICANUS Lec., Cope Check List N. Amer. Rept. & Batr., 1875, p. 29. *Bufo americanus* (Leconte) Holbr., N. A. Herp., v, pl. 4; Dum. & Bibr., p. 695; Hallow, Proc. Ac. Phila., 1856, p. 251; Girard, U. S. Mex. Bound. Surv., ii, p. 25; Wied., Nova Acta, xxxii, p. 121. *Bufo copei* Yarrow & Henshaw, Rept. Batr. Expl. W. of 100th Mer., 1878, p. 4.
Eastern and Austroriparian regions.

B. L. LENTIGINOSUS Shaw, Cope Check List N. American Rept. & Batr., 1875, p. 29. *Bufo lentiginosus* Shaw, Zoöl., iii, p. 173; Gird., Proc. Ac. Phila., 1854, p. 86. *Chilophryne lentiginosa* Cope, Proc. Ac. Phila., 1863, p. 357. *Bufo musicus* Latr., Rept., ii, p. 127; Daud. Rain, p. 9, pl. 33, f. 3, and Rept., viii, p. 190; Merr. Teut., p. 185; Gravenh. Delic., p. 59.
Austroriparian region.

BUFO QUERCICUS Holbrook, North American Herpetology, v, p. 13, 1842, tab. iii. *Chilophryne dialopha* Cope, Pr. A. N. S. Phila., 1862, p. 341 (erroneous locality). *Bufo dialophus* Boulenger, Cat. Batr. Sal. Brit. Mus. ed., ii, 1882, p. 319.
Austroriparian region.

BUFO VALLICEPS Wiegm., Isis, 1833, p. 657. *Bufo granulosus* Baird & Girard, Proc. Ac. Phila., 1852, p. 173. *Bufo nebulifer* Girard, Proc. Ac. Phila., 1854, p. 87. *Chilophryne nebulifera* Cope, Proc. Ac. Phila., 1862, p. 357.
Texan district of Austroriparian region; Mexican region, etc.

## RANA Linn.*

RANA HALECINA Daudin (Kalm), Hist. Nat. Rept., viii (1803), 122, 432. *Rana aquatica*, Water Frog, Catesby, Carol., ii (1743), 70. *Rana pipiens* Gm., ed. L. Syst. Nat. (1788), 1052–28. *Rana utricularia* Harlan, Sillim. Journ., x (1825), 60. *Rana virginiana* Lam., Syn. Rept., p. 31. *Rana palustris* Guérin, Iconogr. Rept., pl. 26, f. 1. *Rana oxyrhyncha* Hallow, Proc. Acad. Phila. (1856), p. 142. *Rana berlandieri* Baird, U. S. Mex. Bound. Surv. Rept., p. 27, pl. 36, f. 7–10. *Rana lecontei* "B & G." Günther Cat. Bat. Sal. Brit. Mus. 1858, 15; Brocchi Miss. Sci. Mex. Rept., p. 14, pl. iv, f. 1. Boulenger Cat. Bat. Sal., B. M. 1882, p. 42; nec Baird et Girardii.†
Nearctic realm, except Pacific region.

R. H. SPHENOCEPHALA Cope. *R. oxyrhyncha* Hallow, Proc. Acad. Phila., 1856, p. 142, nec Sundevalii.
Austroriparian region.

R. H. HALECINA Kalm (Cope). *Rana berlandieri* Baird, l. c.
Eastern and Austroriparian regions.

R. H. BRACHYCEPHALA Cope. *R. h. berlandieri* Cope, Check List Batr. Rept. N. Am., p. 32, nec *Rana berlandieri* Baird. *Rana halecina* Boulenger, Cat. Batr. Brit. Mus. ed, ii, p. 41, néc Kalmii.
Central and Sonoran regions.

RANA AREOLATA Baird & Girard. Proceeds. Acad. Phila. 1852, p. 173; Baird, U. S. Mex. Bound. Surv., pl. 36, f. 11–12.
Austroriparian region, extending north in Mississippi valley.

R. A. AREOLATA Bd. & Gird. *Rana areolata* Baird & Girard, Proc. Acad. Phila., 1852, p. 173; Baird, U. S. Mex. Bound. Surv., pl. 36, f. 11, 12.
Austroriparian region.

R. A. AESOPUS Cope, s. sp. nov.
Florida.

Length of head two and a half times in the total; tympanic disk a vertical oval; dorsal spots well separated; nostril equidistant between end of muzzle and eye.

This singular form may be known at once by the short and squat form of the body as compared with the size of the head, resembling in this some of the Australian Cystignathidæ.

The muzzle is not prominent, and does not project beyond the upper lip. The canthus rostrales are straight, and the top of the head is flat. The tympanic disk is a vertical oval, of which the short diameter is one half the length of the eye. The edge of the vomerine patches of teeth

* The determination of the relations between the North American and European species of this genus have been greatly facilitated by the admirable researches of Boulenger.

† The Mexican specimens referred to in these citations constitute a subspecies, which I call *R. h. austricola*.

are a little posterior to the line connecting the posterior border of the nares. The latter are about as large as the ostia pharyngea.

The dorsolateral glandular ridge is thick and extends a little beyond the sacral diapophysis. There are six or seven rows of short longitudinal glandular tubercles in the space between them. There are similar elongate warts on the sides. The posterior and posteroinferior faces of the femora finely granular; rest of the inferior surfaces smooth.

The first finger is longer than the second and equals the fourth. The heel of the extended hind leg reaches to the middle of the eye. The foot is of moderate length. Three of the phalanges of the fourth digit are entirely free, and the web is excavated to opposite the middle of the first phalange, extending as a margin on each side of the distal half. The inner cuneiform tubercle is not large and has an acute apex; no external tubercle. A slightly defined tarsal dermal ridge.

In alcohol the ground color is light brown, with the dorsolateral ridge and the inferior surfaces straw-color. The spots are a dark brown, and do not appear to have been yellow bordered. The dorsal spots are irregularly rounded, and are in three or four longitudinal rows. There are two rows on the top of the muzzle and head, crossing the inner edge of the eyelid. There are two spots near the external edge of each eyelid. Spots on the sides smaller, in about four rows. The lores and upper lips are rather coarsely marbled with brown; gular region faintly speckled with the same. No band, but a spot on the front of the humerus; a spot on the elbow, and three cross lines on the fore arm. Four narrow cross lines on the femur, and five across the tibia. Three cross bars on the external face of the fifth toe. The posterior face of the femur has numerous rounded brown spots on a light ground.

| *Measurements* (*No. 4743*). | M. |
|---|---|
| Length of head and body | .062 |
| Width of head at posterior edges of tympana | .020 |
| Length " to " " " " | .024 |
| Length of fore leg | .026 |
| " " fore foot | .012 |
| " " hind leg, to groin | .074 |
| " " tibia | .024 |
| " " tarsus | .013 |
| " " rest of foot | .025 |

The only specimen of this subspecies which I have seen is the following: No. 4743, Micanopy, Fla. Dr. T. H. Bean.

R. A. CAPITO Leconte, Proc. Acad. Phila., 1855, p. 425.
Floridan district.

R. A. CIRCULOSA Rice & Davis. *Rana circulosa* Rice & Davis, in Jordan's Manual of Vertebrata of Eastern North America, ed. ii, p. 255.
North Central Eastern region. (Illinois.)

RANA PALUSTRIS Leconte. *R. palustris* Leconte, Ann. Lyc. N. Y., i, p. 282. *R. pardalis* Harlan, Amer. Journ., x, p. 50.
Eastern region.

RANA SEPTENTRIONALIS Baird, Proc. Acad. Phila., 1855, p. 51. *R. sinnata* Baird, l. c.
Eastern region, Canadian and Hudsonian districts.

RANA CLAMATA Daudin, Hist. Nat. Rept., viii (1803), 104–431. *R. clamitans* Daudin, in Sonn. & Lat. Hist. Nat. Rept., ii (1802), 157. *R. fontinalis* Leconte, Ann. N. Y. Lyc., i (1825), 282. *Ranaria melanota* Rafin, Annals of Nature (1820), No. 25. *Rana melanota* (Raf.) Harl., in Sill. Am. Jour. Sc., x (1825), 64. *Rana flavoviridis* Harl., in Sill. Am. Jour. Sc., x (1825), 58; *Rana horiconensis* Holbrook, N. A. Herp., 1st ed., iii (1838), 91. *Rana nigricans* Agassiz, L. Sup. (1850), 379, vi, f. 4, 5.
Eastern region.

RANA CATESBEIANA Shaw. *Rana catesbiana* Shaw, Gen. Zoöl., iii, Amphibia (1802), 106, pl. xxxiii. *Rana boans* Lacep, Hist. Nat. Nuad. Ovip. (1st ed., 1798), ed. Deteoville, i (1819), 270, 315. *Rana pipiens* Harl. (nec. Linnæus), Sill Am. Jour. Sc., x (1825), 62. *Rana mugiens* Merrem., Tentamen Syst. Amph. (1820), 175. *Rana scapularis* Harl., Sill. Am. Jour. Sc., x (1825), 59. *Rana maxima americana aquatica* Catesby, Carol., ii (1743), 72. *Rana cuspersa* Leconte, Proc. Ac. Phila., 1855, p. 425.
Eastern region.

RANA TEMPORARIA Linn., Syst. Nat., ed. 12, p. 357, pars. *Rana muta* Laur, Syn. Rept., p. 30. *Rana temporaria* Schneider, Hist. Amph., p. 113. *Rana flaviventris* Millet, Faun. Maine et Loire, ii, p. 663. *Rana cruenta* Pallas, Zoögr. Ross.-As., p. 12. *Rana alpina* Risso, Hist. Nat. Eur. mér., iii, p. 93. *Rana scotica* Bell, l. c., p. 102. *Rana platyrrhinus* Steenstr., Amtl.-Ber., 24, Vers. Kiel, p. 131. *Rana fusca* De l'Isle, Ann. Sc. Nat., ser. 5, xvii, 1873. *Rana temporaria*, var. *platyrrhina* Schreib., Herp. Eur., p. 125. *Rana dybowskii* Günth., Ann. & Mag. N.H., 1876, xvii, p. 387; Catal. Bat. Sol. Brit. Mus., ed. i, p. 16.
Europe, Northern and Temperate Asia.

R. T. PRETIOSA Bd. & Gird. *Rana pretiosa* Bd. & Gird., Proc. Ac. Phila., 1853, p. 378; Baird, Proc. Ac. Phila., 1855, p. 378; Gird., U. S. Expl. Surv., xii, part ii, p. 304; Boulenger, Bull. Soc. Zoöl. Fr., 1880, p. 208; Cope, Proc. Ac. Phila., 1883, pp. 20, 33; Am. Nat., 1879, p. 435.
Pacific region.

RANA CANTABRIDGENSIS Baird, Proc. Ac. Phila., 1854, p. 62. *Rana sylvatica* Dekay, N. Y. Fauna, iii, p. 64, pl. 21, 22. *Rana temporaria*, var. *sylvatica* pt. Günth., Cat. Brit. Mus., 1868, p. 17. *Rana temporaria cantabridgensis* Cope, Check. List. N. Amer. Batr. Rept. 1875, p. 32.
Canadian and Hudsonian districts of Eastern region.

R. c. LATIREMIS Cope.

This form looks very different from the true *Rana cantabridgensis*. Muzzle rather obtuse, more so than in the typical *R. cantabridgensis*, and widened posteriorly; its length at the posterior edge of the tympana entering the length of the head and body three and a half times. The tympanic drum is very distinct, and its long diameter enters that of the eye two-thirds of a time. The nostrils are equidistant between the orbit and the end of the muzzle, and look upwards. The skin is quite smooth everywhere, and the dorsolateral fold is easily obliterated by immersion in alcohol. The heel of the extended hind leg reaches to the middle of the eye; the second toe reaches nearly to the apex of the knee. The palmation is remarkably wide, leaving but one free phalange and all the digits except the fourth, where two are free. The internal cuneiform tubercle is quite prominent, with an obtuse convex edge; there is no external tubercle. The internal finger (index) is short and stout, and is very little or not at all longer than the second (third) finger.

Color, above, light brownish-gray; below, white. There are more or less numerous black spots on the sides, which incline to fuse more or less imperfectly into a longitudinal band along the dorsolateral dermal fold. There are in some specimens a few small black marks on the back between the lateral folds. A dark line along the canthus rostralis. The black "ear patch" is reduced to a black line, which passes from the eye posterior to the tympanic disk, and ceases opposite the inferior border of the latter.

| *Measurements (No. 13,723).* | M. |
|---|---|
| Length of head and body | .052 |
| Width of head at posterior edge of tympana | .019 |
| Length of " " " " " " | .015 |
| Length of fore limb | .022 |
| " " " foot | .011 |
| " " hind limb to groin | .071 |
| " " tibia | .020 |
| " " tarsus | .012 |
| " " remainder of foot | .025 |

Four specimens from Lake Alloknagits, Alaska; obtained by C. L. McKay.

R. c. CANTABRIDGENSIS Baird.

Hudsonian district of Eastern region.

RANA AGILIS Thomas. *Rana temporaria*, var. *arvalis* part Günth., Cat., p. 16. *Rana temporaria* Millet, Faune Maine et Loire, ii, p. 664. *Rana agilis* Thomas, Ann. Sc. Nat., sér. 4, iv, p. 365, pl. 7. *Rana gracilis* Fatio, Rev. Mag. Zoöl., sér. 2, xiv, p. 81. *Rana temporaria*, var. *agilis* Schreb., Herp. Eur., p. 135.

Middle latitudes of Europe (Boulenger).

R. A. AURORA Baird & Girard. *Rana aurora* B. & G., Proc. Ac. Phila., 1862, p. 174, and U. S. Explor. Exped., Herp., p. 18, pl. 11, f. 1–6.
Washington and Oregon.

RANA DRAYTONI Baird & Girard. *Rana draytoni* B. & G., Proc. Ac. Phila., 1862, p. 174; Girard, U. S. Explor. Exped., Herp., p. 23, pl. 11, f. 19–24. *Rana lecontei* Baird & Girard, Proc. Ac. Phila., 1853, p. 301; *Rana nigricans* Hallow, Proc. Ac. Phila., 1854, p. 96; Boulenger, Bull. Soc. Zoöl. Fr., 1880, p. 207; Brocchi, Miss. Sc. Mex. Batr., p. 15, pl. iv, f. 3. *Rana longipes* Hallow, U. S. Explor. Surv., x, 1859, iv, Zoöl., p. 20, pl. x, f. 1. *Epirhexis longipes* Yarrow, Check List and Catal. of Specimens of N. Amer. Rept. Batr., 1883, p. 176, not of Baird and Cope.
Pacific, and Western part of Central regions.

R. D. DRAYTONI Baird & Girard.
California.

R. D. ONCA Cope, in Yarrow's Rept. Expl. Surv. W. of 100th Mer. Zoöl., Vol. v, p. 528, pl. 25, f. 1–3.
Utah.

RANA BOYLII Baird, Proc. Ac. Phila., 1855, p. 62.
California.

RANA SILVATICA Lee. *Rana sylvatica* Lee, Ann. N. Y. Lyc., i (1825), 282. *Rana pennsylvanica* Harlan, Sill. Am. Jour. Sc., x (1825), 58.
Eastern region.

RANA PACHYDERMA Cope, Proc. Ac. Phila., 1883, p. 25.
Northern California and Southern Oregon.

## URODELA.

PLETHODON CRASSULUS Cope, sp. nov.

This species has a superficial resemblance to the *P. oregonensis*, but its manifold differences are easily perceived.

The form is quite robust, and the head is large, its width going into the length to the thighs only five times. The tail is very much compressed from the base, and is also shallow; its length equals the distance from its base to the gular fold. The legs are robust, but not very long; when appressed to the side they fail to meet by the length of the posterior foot.

The tongue is large, filling the floor of the mouth. The vomeropalatine teeth are in two short series, which converge backwards without coming into contact, from behind the internal edge of the choanæ. The parasphenoid teeth are in a single, undivided patch, which commences well behind the vomeropalatines. The maxillary and mandibular teeth are minute.

The head, viewed from above, is oval; in profile the muzzle is thick and truncate, and projects beyond the mouth. The edge of the lip is slightly angulate below the nares. The eye is rather large, its length

equaling that of the muzzle. The distance between the nostrils is equal to that between the bases of the eyelids at their middles. The toes are short and free, one phalange of the first digit on each foot projecting. The ends of the toes are obtuse and bulbiform. A gular fold. Lateral folds fourteen.

| *Measurements* (*No. 4947*). | M. |
|---|---|
| Total length | .0625 |
| Length of head and body | .034 |
| " to groin | .0314 |
| " " axilla | .0045 |
| " " line of rictus oris | .006 |
| " " " " eye | .0035 |
| " of fore leg | .0095 |
| " " " foot | .0032 |
| " " hind leg | .0095 |
| " " " foot | .004 |
| Width of head | .0077 |
| " between eyes | .0025 |

Color, above, uniform dark reddish-brown; below, uniform light brown.

I have seen but one specimen of this species, as follows:

| *No.* | *No. of specimens.* | *Locality.* | *Collector.* |
|---|---|---|---|
| 9447. | 1. | California. | Dr. J. G. Cooper. |

AMBLYSTOMA DECORTICATUM Cope, sp. nov.

This species has a good deal of affinity in its characters to the *A. paroticum* Baird, but it differs in important points of structure, as well as in its external appearance.

Its general proportions are not slender, and the limbs, especially the posterior ones, are very stout. The tail is long and is compressed from the base. It does not bear a fin at any part. Its length, in the single specimen before me, is equal to that of the head and body (including the vent), less the distance from the eye to the end of the muzzle. The head is short and the muzzle is contracted, and is steeply rounded in profile. The distance from the muzzle to the axilla enters the length from the axilla to the groin one and a half times. The width of the head enters the total length to the groin four times. The limbs when pressed to the side overlap by the length of the fingers.

There is no canthus rostralis, and the lower jaw does not project beyond the upper. The external nares are almost terminal, and are as far apart as the distance between the inner borders of the choanæ. The latter are rather large and are transverse. The vomeropalatine series of teeth form a short transverse band which is within the lines of the internal borders of the inner nares, and a considerable distance posterior to them. The tongue is wider than long, but does not fill the wide floor of the mouth laterally.

A dermal groove extends posteriorly from the eye to the side of the neck above the anterior border of the humerus. A branch groove descends a short distance posterior to the eye and turns forwards to the canthus of the mouth. These grooves divide masses of crypts, those on the inferior side of the groove being most prominent. The tract above the groove resembles the parotoid gland of the *Amblystoma paroticum*, but is much less distinctly defined, fading out upwards.

There are eleven well-defined lateral dermal folds, and space for a twelfth, which will probably be found well defined in other specimens. The back from the interscapular region posteriorly, and the superior part of the tail, are thickly studded with crypts. There is a slightly defined gular fold.

The fore limb is as long as from its anterior base to the anterior margin of the eye. The toes are quite short, and their lengths, beginning with the shortest, are 5–2–3–4. The posterior foot is especially robust, and the sole is wider than the length of the longest finger. There are no distinct tubercles on the sole. The lengths of the toes are, beginning with the shortest, 1–5–2–4–3.

| *Measurements* (*No. 14,493*). | M. |
|---|---|
| Total length | .174 |
| Length to base of tail | .090 |
| " " groin | .071 |
| " " axilla | .031 |
| " " line of eyes | .005 |
| " of fore leg | .026 |
| " " " foot | .010 |
| " " cubitus | .008 |
| " " hind leg | .026 |
| " " " foot | .0105 |
| Width between nostrils | .005 |
| " " eyes | .006 |
| " of head | .016 |
| " " sole | .008 |
| Depth of tail at middle | .008 |

The manner of describing the color pattern of this species depends on what we regard as the ground. We can assume that the ground color is represented by a dark chocolate brown and say that this is closely studded with brownish white spots of irregular forms and sizes. On the back, limbs, and top and sides of the head, the pale spots are so close together as to reduce the brown to a net-work; on the fore legs the pale spots are larger than anywhere else. The spots are few on the tail, and those chiefly near the base. The inferior surfaces are dirty light brown.

The characters which separate this species from the *A. paroticum* are, the much shorter series of vomeropalatine teeth; the shorter fingers and toes; the less distinct parotoid glands; the shorter and more obtuse head, and the coloration.

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It is the first and only species of Amblystoma yet found in Alaska.

| *No.* | *No. of specimens.* | *Locality.* | *Year.* | *Collector.* |
|---|---|---|---|---|
| 14,493. | 1. | Port Simpson, Alaska. | 1885. | T. H. Streets, U.S.N. |

AMBLYSTOMA LEPTURUM Cope, s.p nov.

This species resembles the *A. cingulatum*, but differs from it in the entirely different form and proportions of the tail. This part is very slender in the *A. lepturum*, with round or vertical oval section, without keel above, and lacking very little of being as long as the head and body together. The legs are of the same proportions as in the *A. cingulatum*; that is, when appressed they are separated by a space equal to the length of the posterior foot, showing their greatly superior length to those of the *A. microstomum*. The body is cylindric. The head is an oval, with produced and rounded muzzle, which projects beyond the lower jaw. The animal resembles a Plethodon rather than the species of Amblystoma, but its vomerine teeth and tongue have all the characters of the *Amblystoma microstomum*.

The vomerine teeth form a convex series extending forwards to a point between the choanæ, where they are slightly interrupted on the middle line. The tongue is large, filling the floor of the mouth, and is extensively free at the sides only. The external nostrils are nearly terminal and are rather near together, the space between them being equal to just half that between the bases of the eyelids, and about three-fifths that between the choanæ. The width between the eyes behind is equal to the axial length from the same to the end of the muzzle. The width of the head enters the length to the groin seven times. The length from the muzzle to the axilla enters the distance from the latter to the groin one and three-fifth times.

The lateral digits are distinct, and the median ones moderately elongate. Their lengths, beginning with the shortest, are, fore foot, 2–5–3–4; hind foot, 1–5–2–3–4. The phalanges are, fore foot, 2–2–3–2; hind foot, 2–2–3–4–2. No palmar or plantar tubercles.

The skin is perfectly smooth, and between the axilla and the groin it is marked by fourteen grooves. There are no dermal margins to the fingers or the tail. The cloacal orifice is a simple slit. There is a distinct postgular fold.

| *Measurements (No. 14,583).* | M. |
|---|---|
| Total length | .115 |
| Length from end of muzzle to base of tail | .092 |
| " " " " " " groin | .0515 |
| " " " " " " axilla | .020 |
| " " " " " " canthusoris | .0065 |
| " of fore leg | .013 |
| " " " foot | .0055 |
| " " hind leg | .016 |
| " " " foot | .0075 |
| Depth of tail at middle | .0025 |

The color of the typical specimen in alcohol is purplish brown above and paler below. There are numerous not well-defined whitish spots on the sides and a few on the belly, and there are some very faint and delicate gray lines across the posterior part of the back. The tail is densely speckled with gray on the sides, and delicate gray lines cross the upper surface of thetail in a reticulate manner. The limbs are paler than the back, and the digits are cross-banded with whitish.

The habitat of this species is unknown. The only specimen was found in a jar with a specimen of *Diemyctylus torosus*, and one of *Rana temporaria*, the former Californian, the latter Palæarctic.

AMBLYSTOMA ANNULATUM Cope, sp. nov.

The largest species of the group of the *A. microstomum*, and resembling that species rather than the *A. cingulatum*. However it approaches the last-named species in the form and length of its tail, but exceeds that and all the other species of Group V in the length of that part of the body.

The muzzle is very short, and the head is not distinguished from the neck. The legs are short, and when appressed to the sides are separated by a space of three and parts of two other intercostal spaces, equal to four spaces. The tail is in section cylindric at base, and widely oval to near the extremity, where it is more narrowly oval. It is not angulate and has no dermal margin on the middle line above or below. Its length exceeds that of the head and body by the length of the anterior foot, and it may have been longer, as the extremity is injured.

The head is short, and the width enters the length to the groin six and a quarter times. The front is convex to the upper lip, in profile, and transversely between the orbits. The parietal region is very convex transversely. The width between the canthi oculorum behind exceeds the length from the same point to the end of the muzzle. The nostrils present anteriorly, and they are not quite so close together as in *A. lepturum*, as the distance between them measures two-thirds the width between the eyelids. The vomerine teeth form two transverse fasciculi of several rows of teeth each, between the choanæ, convex forwards, and separated on the middle line by a very short interval.

The skin is perfectly smooth, there is a postgular fold, and the sides are crossed by thirteen folds with space enough at the axilla for a fourteenth. The tail is also very distinctly annulate-grooved. I count thirty-one grooves behind the femora, and the injured extremity is not grooved. Indistinct grooves are apparent on the tails of several of the species of Amblystoma. There are no rows of mucous pores on the head or body of this species, nor accumulations of crypts on the head, body or tail.

The palm is wide, and the fingers not long, though of unequal length. The lengths of the fingers, beginning with the shortest, are 2-5-3-4, and their phalanges number 2-2-3-2. The toes of the hinder foot have, in order of length, 1-5-2-3-4, and of phalanges, 2-2-3-4-2.

| *Measurements* (*No. 11,564*). | M. |
|---|---|
| Total length | .186 |
| Length to base of tail | .092 |
| " " groin | .077 |
| " " axilla | .022 |
| " " canthus oris | .009 |
| " of fore limb, from axilla | .0172 |
| " " " foot | .007 |
| " " hind limb, from groin | .022 |
| " " " foot | .012 |
| Width of head | .012 |
| Depth of tail at middle | .009 |

The typical and only specimen is preserved in alcohol. The color above, everywhere, is dark brown; below, very light brown. The sides are paler, perhaps pale yellow in life, and the color ascends at several points, so as to form cross-bands of moderate width and very well defined. One of them crosses at the occiput, and one at the axillæ; between the latter and the groin there are five, nearly equidistant. There is an imperfect one at the sacrum, and there are seven on the tail, one of them imperfect. The coloration of this species is quite unique in the genus in its regularity.

The locality of the only specimen is unknown.

NOTES.—I add here that the *Plethodon ïëcanus* Cope proves to be a well-marked species of Anaides. The species was described from a young one. Also that a study of all the Amphiumidæ accessible to me, shows that the two and three-toed forms must be referred to a single species, the *A. means* Gard.

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## *Is there Reciprocity in Trade? And the Consumption of Manufactured Commodities.* By Thos. H. Dudley.

(*Read before the American Philosophical Society, October 1, 1886.*)

One of the chief arguments used by the free trader against the protective system in the United States is that of reciprocity in trade. Indeed it may be regarded as one of the chief corner-stones upon which their free-trade theory is based.

Their formula is, that if I do not buy of you, you will not buy of me. And from it they argue that if the people of the United States continue their protective system and refuse to buy their manufactured commodities of England, the English people will refuse to buy anything of them.

The doctrine, when carried to its legitimate conclusion as they contend for it, is this: We are to repeal our protective laws, so as to enable the English to bring into our markets their manufactured commodities and sell to our people free of duty; and to this extent at least giving the English

manufacturer, who pays no taxes in the United States, the right to supplant our manufacturer with his commodities, made in England and by English workmen; leaving our own people to pay their taxes and to live as best they can without work. If we do not do this, they say, the English people will not buy our surplus agricultural products.

It must be noted here that every dollar's worth of manufactured goods brought from England and sold in the United States, takes just one dollar's worth of work from our people. If it is made or produced in England the workman there gets the benefit, that is, the wages for its production. If made in this country, the workman here gets the benefit, the wages for making it.

When it is remembered that, if it is extended to all our industries, it will amount to hundreds of millions of dollars; and to hundreds of thousands of working people who will be affected by the transfer of our manufacturing to England, the importance and magnitude of the question is seen, especially upon the working people of this country, the men who have to earn wages by labor in order to live.

But the subject we are considering is that of reciprocity; and as so much stress has been laid upon it by the free traders in England, as well as by those who sympathize with them in this country, it is of some importance to learn whether as a principle it is true or untrue. In other words, whether it has the effect upon trade that is claimed for it.

The foreign commercial relations or dealings between nation and nation are never carried on by the governments, that is, one government dealing with another government, but by individuals. The individuals of one nation dealing with the individuals of another nation.

If it were the English government dealing directly with the American government, then she might say to us: If you do not repeal your tariff laws and buy your manufactured commodities of us instead of making them yourselves, we, the English, will not buy of you what we may require in agricultural products or anything else. But unfortunately for the argument, it is not the English government dealing with the United States government, or with our people, but it is the English merchant dealing with the American merchant, and the whole transaction is business with both. It is a question of price that governs all their transactions. The English merchant, whether it is provisions or cotton, buys wherever he can purchase what he requires the cheapest. He never looks, considers or cares about the balance of trade, whether it is on the one side or the other. His object in doing business is to make money. And all his contracts and dealings are based on this idea, and he buys wherever he can buy to the best advantage without regard to reciprocity. If it is ten thousand bushels of wheat that he requires, and he can buy it cheaper in New York than he can in Odessa, he buys it in New York; if on the other hand he can buy it cheaper in the Crimea or India, he buys it there, and not in New York. It is price, and it alone, that controls the matter. And so with every other product or commodity that the English merchant

or American merchant deals in. And as a rule this will apply to every commercial transaction in the United States, in England or in any other civilized country. And with reciprocity falls another favorite doctrine of the free traders closely allied to reciprocity, to wit, barter—*that for every import there must be an export.* Mr. Mongredien, in his writings for the Cobden Club of England, states it in this way: "The increased imports which abolition of customs duties would bring about, would necessitate increased exports to the same amount to pay for them, *for there can be no additional import without a corresponding export.*"

The theory of the free traders is, that when you buy a bill of goods in a foreign country and import them, they must be paid for by an export of some product or commodity from the country into the one from which the import came; that an export will follow the import; that it is a mere barter or trade of one product for another product.

This theory of the free traders has been asserted so often and insisted upon with so much persistency for such a period of time that they seem to regard it as admitted, and not even open to criticism, much less contradiction; and they demand that the whole world shall assent to and admit it, and of course all the pernicious and false assumptions and arguments which are based upon it. I have had occasion to comment upon this subject before, in my reply to Mongredien, and pronounced it a fallacy. I repeat it again, and say no greater fallacy has ever been attempted to be palmed off upon an intelligent people. It is neither true in theory nor in practice, and never has been. However beautiful it might be in theory, that if for every import there was a corresponding export, in practice it never has been true, and the trade of the civilized nations of the world for the last hundred years, if we examine it, proves it to be untrue. An export of a product does not follow every import of a product. In the dealings between merchants, whether at home or abroad, whether between each other here in the United States or with those who live in England or in any other country, the contracts or transactions in their dealings with each other are based upon money or cash and not upon barter or trade: that is, are to be paid for in money, and not in barter of one commodity for another commodity; and this applies whether the contract is for cotton, wheat, steel rails or woolen goods; the one who buys agrees to pay for it in cash or money, and a trade of one commodity for another commodity is quite exceptional and out of the common or ordinary mode of mercantile transactions. If Mr. Vanderbilt should want a thousand tons of steel rails, and he should buy them of Naylor, Benson & Co., of London, he would pay for them in cash or money and not in merchandise; and there would be no obligation, either expressed or implied, on the part of the London house or anybody else, that because of the purchase of the rails they should buy grain or other merchandise from Mr. Vanderbilt or any other person in the United States. If there were millions of bushels of wheat piled up in every seaboard city of this country, they would not take it. If you were to appeal to them they would tell you that their

business was confined to tin plates and metals, &c., and that they did not deal in grain. If Naylor, Benson & Co., who have sold the steel rails, are not under obligations to reciprocate, and take a corresponding quantity of merchandise in value to the amount for which they sold the rails, in order to make an export follow the import of the rails, who are under obligations to do so? The answer is, no one. And though our granaries may be full and running over with grain, the corn merchant of Liverpool or London will not buy it unless they can purchase it cheaper than they can elsewhere, and then they will take only the quantity which they require and no more. As has been stated, if they can buy it cheaper in Russia or India than they can of us they will buy it there, and that without the least regard to the fact that Mr. Vanderbilt bought his steel rails in England; and it would be the same if we were to stop manufacturing steel rails in the United States and buy all we require in England, even if it should be to the extent of their whole production. This will apply with equal force to every other manufactured commodity made, or product which the earth yields. As has been remarked, it is not the nations, as governments, dealing with other nations, but individuals; and each anxious to make out of every transaction or contract, whether domestic or foreign, all that can be made legitimately, and that without regard to the interests of nations or other individuals. If we examine the statistics of every civilized country on the globe, this will be verified. And permit me here to say, that while every writer upon political economy in England is proclaiming and asserting that for every import there must be an export, and claiming the doctrine of reciprocity in trade as I have stated it—the last named of which has been so often used to frighten our people and especially the farmers of our country, that if we do not buy of them they will not buy of us—there is no country in the world where the fallacy and falseness of these doctrines are shown by their own published trade reports more fully than they are in England. Their aggregate imports for the last thirty years, without one single exception, have every year exceeded their exports. They have not shown in any of their writings or reports that in one single instance the export has followed the import. The figures for the last ten years, as taken from their trade reports, printed by order of Parliament, are as follows:

| *Years.* | *Total Imports.* | *Total Exports.* |
|---|---|---|
| 1875 | £373,939,577 | £281,612,323 |
| 1876 | 375,154,703 | 256,776,602 |
| 1877 | 394,419,682 | 252,346,020 |
| 1878 | 368,770,742 | 245,483,858 |
| 1879 | 362,991,875 | 248,783,364 |
| 1880 | 411,229,565 | 286,414,466 |
| 1881 | 397,022,489 | 297,082,775 |
| 1882 | 413,019,608 | 306,660,714 |
| 1883 | 426,891,579 | 305,437,070 |
| 1884 | 390,018,569 | 295,967,583 |
| | £3,913,458,389 | £2,776,564,775 |

Making the total imports for the United Kingdom more than the total exports for the last ten years £1,136,893,614, or in our money $5,502,565,091.

It is not pretended, in these published reports of their trade, that there has been an export for every import. So far from this, they show right the contrary. They give us the total value of all their exports of British and foreign and colonial produce, and all their imports each year, and they show that their exports fall short of their imports by more than five billion five hundred millions of dollars in the last ten years of their trade. And it has been the same for more than thirty years in their dealings. In each of these years they have published a report of their trade for the year, and in each and every report they give their imports and exports for that year; and from it we find that each and every year during this period the import has been in excess of the export, virtually admitting that there has not been an export for every import. The appalling figures in these reports of the terrible condition of their trade with foreign nations, stand out in bold relief, and give a crushing denial to their assumed but fallacious dogma. And there is no excuse or explanation given, or pretended to be given, in any one of these annual trade reports that have been published during this time, why the export has not followed the import, as they assert it should have done.

If you include the exports and imports of gold and silver in the United Kingdom, they do not get over the difficulty or to any very great extent change the figures given above as to the excess of the imports over the exports. Persons familiar with the depression of trade in England and the suffering of the working people for want of employment, will find there ample ground to account for the depression and the want and misery that exist there.

A nation cannot continue forever to buy more than she sells and be prosperous any more than an individual can. If the outgoes are more than the income, in time ruin and bankruptcy must follow. It is true of individuals and it is equally true of nations.

The figures in these annual reports of course are made up from the united dealings of the people of the kingdom with the people of other countries. In order still further to prove the falseness of this theory, we will examine these same English reports and take their dealings with the people of some of the other nations.

And first let us take France, their nearest neighbor, and see whether in their dealings with this nation the exports have followed the imports. The figures for the last ten years of their trade are as follows:

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1875 | £46,720,101 | £27,292,455 |
| 1876 | 45,304,854 | 29,000,273 |
| 1877 | 45,823,324 | 25,663,602 |
| 1878 | 41,378,896 | 26,595,958 |
| 1879 | 38,459,096 | 26,558,333 |

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1880 | £41,970,298 | £27,990,959 |
| 1881 | 39,984,187 | 30,085,661 |
| 1882 | 39,090,381 | 29,758,427 |
| 1883 | 38,363,022 | 29,409,335 |
| 1884 | 37,437,014 | 26,339,443 |
| | £414,804,173 | £278,694,446 |
| | 278,694,446 | |
| | £136,109,727 | |

The imports for the last ten years from France are £136,109,727 more than their exports, or in our money $658,771,078. If you go back for twenty years you will find the same disparity between the import and export, except for the year of the German war, when the exports exceeded the imports by a small amount.

We will next take Denmark. The figures of their trade with the people of this nation for the last ten years are as follows:

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1875 | £4,241,671 | £2,756,145 |
| 1876 | 4,217,934 | 2,598,707 |
| 1877 | 3,950,229 | 2,332,911 |
| 1878 | 4,584,544 | 1,900,135 |
| 1879 | 4,675,090 | 1,984,767 |
| 1880 | 5,285,767 | 2,347,573 |
| 1881 | 4,611,999 | 2,431,193 |
| 1882 | 5,249,467 | 2,489,182 |
| 1883 | 6,254,998 | 2,597,807 |
| 1884 | 5,248,244 | 2,600,591 |
| | £48,319,943 | £24,039,011 |
| | 24,039,011 | |
| | £24,280,932 | |

The imports for the ten years of their trade with Denmark have been more than double the exports, and the imports have been more than double the exports for the last twenty years.

We will now take Sweden and Norway. The figures of their trade with England for the last ten years, are as follows:

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1875 | £8,918,638 | £6,296,995 |
| 1876 | 10,654,311 | 6,323,606 |
| 1877 | 10,454,475 | 6,197,099 |
| 1878 | 9,127,397 | 4,324,333 |
| 1879 | 8,392,723 | 3,928,682 |
| 1880 | 10,989,000 | 5,132,408 |

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| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1881 | £10,054,051 | £5,037,236 |
| 1882 | 11,758,635 | 5,107,502 |
| 1883 | 11,834,314 | 5,410,972 |
| 1884 | 10,529,115 | 5,304,429 |
| | £102,271,659 | £53,063,262 |
| | 53,063,262 | |
| | £49,649,397 | |

It will be observed here that the imports are nearly double the exports for the ten years. And if you go back for twenty years the same disparity exists between the imports and exports.

We will next take their trade for the last ten years with Spain. The figures are as follows:

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1875 | £8,660,953 | £4,294,490 |
| 1876 | 8,763,146 | 4,796,498 |
| 1877 | 10,842,097 | 4,267,214 |
| 1878 | 9,115,394 | 3,794,734 |
| 1879 | 8,398,776 | 3,758,717 |
| 1880 | 10,669,936 | 4,078,597 |
| 1881 | 11,027,505 | 4,393,821 |
| 1882 | 11,488,265 | 4,847,662 |
| 1883 | 11,623,663 | 4,876,243 |
| 1884 | 10,157,885 | 4,750,746 |
| | £99,777,620 | £43,858,722 |
| | 43,858,722 | |
| | £55,918,898 | |

The imports are more than double the exports; and this holds good with Spain for the last twenty years.

The trade with Russia for the last ten years shows the following figures:

| *Year.* | *Imports.* | *Exports.* |
|---|---|---|
| 1875 | £20,708,901 | £11,346,316 |
| 1876 | 17,574,488 | 8,635,655 |
| 1877 | 22,142,422 | 5,443,973 |
| 1878 | 17,803,852 | 9,458,729 |
| 1879 | 15,876,585 | 10,607,083 |
| 1880 | 16,029,695 | 10,967,517 |
| 1881 | 14,053,221 | 9,277,438 |
| 1882 | 21,047,722 | 8,637,568 |
| 1883 | 20,976,182 | 7,629,883 |
| 1884 | 16,315,408 | 7,588,556 |
| | £182,528,476 | £89,593,718 |
| | 89,592,718 | |
| | £92,935,758 | |

It will be seen that for the last ten years the English people have imported from Russia more than double what they exported to Russia, and during the last twenty-six years there has not been a single year but what the imports have exceeded the exports, and during this whole time they have been more than double.

The figures for the last twenty-six years are as follows:

| | |
|---|---|
| Imports | £474,080,882 |
| Exports | 213,144,167 |
| Excess of imports over exports | £260,936,715 |

From China, during the last ten years, the imports have amounted to £119,440,038, while the exports to have only been £49,091,938; the imports being very much more than double the exports.

From Egypt, during the last ten years, the imports were £94,528,335, and the exports to only £28,243,538, not one-third the amount of the imports.

From Peru, for the past ten years, the imports from were £35,692,075, and the exports to £11,536,330; the imports being three times in excess of the exports.

In all the above instances in the trade between England and the nations mentioned, the export has not followed the import, but England has bought, each and every year, largely in excess of what these nations have bought of her.

The people of these nations, in their dealings, have followed the usual course of business, each taking from the other what they required and nothing more, and that without regard to the balance of trade or the import from or export to, proving fully the untruthfulness of the doctrine that an export always follows an import. In the case of Russia, where the excess of the imports over the exports has been going on for so many years, this excess of imports has been made up, in almost every instance, of agricultural products.

England has been buying breadstuffs and other agricultural products of Russia without any regard to what Russia bought of her. And as long as the Russian farmer can sell his wheat cheaper than it can be bought in the United States or India, so long will the English corn merchant continue to buy it of Russia, and that without regard to whether the Russian merchant buys his woolen goods or hardware of the English merchant or not. And what has been said with regard to wheat applies with equal force to every other commodity that enters into the trade or dealings between man and man in every civilized nation of the world. A man may trade a handsaw for a jackknife, and no doubt this is sometimes done, but it is not the ordinary course of business between merchants; as a rule they buy what they require and pay for it in cash, and sell it to others in the same manner for cash. If we examine our own trade reports, or those of France, Germany or any other civilized country, we will find the same

disparity between the imports and exports, the figures of their dealings confirming what I have said about the import and the export, and that one very rarely, if ever, follows the other. An export does not always follow an import. And there is no reciprocity in trade between nation and nation, each buying from the other what it requires and nothing more, and that without regard to which side the balance of trade is on in their dealings.

Next after ourselves England raises more revenue from custom duties under her tariff laws than any other country in the world; notwithstanding this it has been and is a source of continual complaint on the part of Englishmen that we have tariff laws, and that we make an effort to protect our laboring people and develop our own resources. The English claim that this interferes with their trade, and that we ought to repeal our tariff laws and admit their manufactured commodities into our country free of duty; and one of the tasks which the Cobden Club of England has undertaken is to break down our protective system and establish free trade in its place; yet, notwithstanding our tariff laws and restrictions about which they so much complain, we buy more of her manufactured commodities than any other nation, and this has been the case for the last five years. During the whole of this period no nation has bought so much of her as we.

We are to-day and have been the best customer England has.

In India England has abolished the tariff, so that there is absolute free trade, at least so far as her manufactured commodities are concerned; and she can send and is sending her manufactured commodities there free of duty and of all tariff restrictions, and yet the two hundred and fifty-three millions of people in India, with free trade so far as English commodities are concerned, take less of England than we do. Our fifty-six millions of people in the United States buy more of England than the two hundred and fifty-three millions of people in India, and more than the ninety-eight millions of people living in the Russian empire.

Why is this? The answer is very easily given. It lies in the fact that the people of the United States consume or use of the manufactured commodities of the world nearly twice as much as the people of any other country or nation, I mean *per capita*, man for man. If asked for an explanation why we use or consume more goods, &c., in this country than they do in England, France or any other country, it is easily given. Under our protective system we pay our people double the wages that are paid to the work people of any country in Europe, and this enables them to buy more. Their power to buy depends upon what they receive for their labor. It is the laboring people of a country who more largely than others consume the products of the mills as well as of the earth. In consequence our laboring people are better fed, better housed, better clothed than the working people of any other country; have the means to buy and do buy not only the necessaries of life, but many of the luxuries as well. They thus live better than the working people of other countries,

more like human beings ought to live, like God intended that man should live; for the earth was given to man not only as a place where he is to exist for a time, but as a home with all that is implied in the term, where food and raiment and the comforts of life should be within the reach of every human being who will labor to obtain them, and that in sufficient quantity to enable him to live as a man ought to live, with the comforts of this life about him.

And whilst we admit that all human systems of governments and laws are imperfect, we contend that the one which affords to the masses of the people the best homes and more of this world's goods in the way of food, clothing and those things which are necessary for their comfort, happiness and welfare, is the nearest perfect, and therefore the best.

We claim this for the American system of protection, and that it has accomplished more for the masses of the people than any other system that has ever been devised or practiced, and at the same time made us in power, grandeur and civilization the first nation in the world.

As an evidence of this and the benefit the masses are receiving from it, we point with just pride to the fact which has just been stated, that the people of this country to-day are consuming probably double *per capita* of the manufactured commodities of the world, and more of the agricultural products than the people of any other country or nation, with all the benefits, comforts and advantages resulting from it; and this of itself, we think, if there was nothing else to commend it, ought to endear it to every human being in our land, and as a system to perpetuate it forever.

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*Stated Meeting, September 3, 1886.*

Present, 8 members.

Vice-President, Dr. W. S. W. RUSCHENBERGER, in the Chair.

Letters of acceptance of membership were read from Prof. Otto Donner, Helsingfors, Finland; Dr. Aristides Brezina and Prof. Edward Suess, Vienna, Austria; Prof. Paul Albrecht, Hamburg, Germany; Victor Duruy, Prof. Abel Hovelacque, Marquis de Nadaillac and Dr. Edward Pepper, Paris, France; Duke of Argyll, Prof. Wm. Crookes and Capt. Richard C. Temple, London, England; Lord Rayleigh, London, England; Mr. William S. Baker, Prof. John Marshall, Prof. John T. Napier, Mr. Samuel W. Pennypacker, Mr. Henry Reed and Prof.

Benjamin Sharp, Philadelphia; Prof. Herbert B. Adams and Prof. William K. Brooks, Baltimore, Md.; Prof. John C. Branner, Bloomington, Ind.; Prof. Antonio Peñafiel, Mexico, Mo.

A letter was read from Mr. Francis Galton, of London, declining membership, for reasons held sufficient by the Society.

Letters of envoy were read from the Geological Survey of India; Société des Naturalistes de la Nouvelle Russie, Odessa; Académie Royale des Sciences, Amsterdam; Bibliothèque de l'Université Royale, Lund; Reale Accademia dei Lincei, Rome; American Antiquarian Society, Worcester; Department of the Interior; United States Geological Survey.

Circulars were received from the United States Naval Observatory as to the continuation of the publication of the "Results of Meteorological Observations made at the Naval Observatory;" from the International Congress of Geology in relation to a proposed geological map of Europe, to be issued under the direction of a specially appointed committee; from the American Public Library and Museum, Frankfurt-am-Main, requesting the Society's publications; from the Verein für Erdkunde in Leipzig, containing the announcement of its Twenty-fifth Anniversary.

Photographs for the Society's album were received from Prof. John C. Branner, of Bloomington, Ind.; Col. Garrick Mallery, of Washington.

Letters indicating a change of address were received from Prof. Japetus Steenstrup, Copenhagen (Frederiksborggade, 18, 2. Copenhagen); Meteorological Office, London (116 Victoria St., S. W.).

Letters were read from Prof. Joseph Hyrtle, of Vienna, stating that on account of blindness he returns No. 122, and requests that nothing further be sent him; the Verein für Vaterländische Naturkunde, Würtemberg, desiring certain of the Society's publications. On motion the request was referred to the Secretaries with power to act.

Acknowledgments were received from Connecticut Histori-

cal Society (72); Institut Egyptien (81–87; 89–122); Académie Royale des Sciences, Amsterdam (116–119); Bibliothèque de l'Université Royale, Lund (116–120); Royal Society of New South Wales (116–121); Verein für Vaterländische Naturkunde, Würtemberg, Comité Geologique, St. Petersburg, 117–121); Observatorio Astronómico Nacional Mexicano (117, 118, 119, 122); K. K. Sternwarte in Prag (120); Prof. Japetus Steenstrup, Copenhagen (120, 121); Société Royale de Zoologie, Amsterdam (120, 121, 122); Prof. E. Renevier, Lausanne, Ministre de l'Intérieur, Brussels, R. Academia dei Lincei, Rome, Musée Guimet, Paris (121); Fondation de P. Teyler, Harlem, Meteorological Office, London, Society of Antiquaries, London, Statistical Society, London; Cambridge Philosophical Society, Prof. James Geikie, Edinburgh, Mr. Benjamin Smith Lyman, Denver (122); Deutsche Morgenländische Gesellschaft, Halle A. S., New Bedford Public Library (121, 122); Department of the Interior; Garten-Bau Verein, Berlin (119).

Donations for the Library were announced from Mining Department, Melbourne; Royal Asiatic Society, Hong-Kong; Royal Asiatic Society (North China Branch), Shanghai; Geological Survey of India; Royal Geographical Society of Russia; Comité Geologique, Profs. Otto Stuve and Serge Nikitin, of St. Petersburg; Société Impériale des Naturalistes, Moscow; Society of Naturalists of New Russia, Odessa; Accademia degli Agiati, Roveredo, Austria; K. K. Geologische Reichsanstalt, Vienna; K. B. Akademie der Wissenschaften and Deutsche Gesellschaft für Anthropologie, &c., Munich; Naturforschende Gesellschaft des Osterlandes, Altenburg; Deutsche Geologische Gesellschaft and S. Calvary & Co. (publishers), Berlin; Naturhistorischer Verein and Prof. G. Vom Rath, Bonn; Verein für Erdkunde, Dresden; Naturforschende Gesellschaft, Emden; Prof. Paul Emil Richter of Freiburg; Oberhessische Gesellschaft für Natur- und Heilkunde, Geissen; "Zoologischer Anzeiger," K. Sachsische Gesellschaft der Wissenschaften and Prof. C. F. Zinchen of Leipzig; Naturhistorische Gesellschaft, Nüremberg; Verein für Vaterländische Naturkunde

in Würtemberg; Editors of the "Naturforscher," Tübingen; Unterfrank. Kreuxifisherei-Verein, Würtzburg; Société de Physique, &c., Geneva; Société Vandoise des Sciences Naturelles, Société Géologique Suisse and Prof. E. Renevier of Lausanne; Prof. François W. C. Trafford of Zurich; K. Akademie van Wetenschappen and K. Zoologisch Genootschap, Amsterdam; Société Hollandaise de Sciences and Archives Néerlandais, Harlem; Biblioteca Nazionale Centrale, Florence; R. Istituto Lombardo di Scienze ed Lettere, Milan; R. Accademia di Scienze Lettere ed Arti, Modena; R. Accademia di Scienze Lettere ed Arti, Padua; Società Toscana Scienze Naturali, Pisa; R. Accademia dei Lincei, R. Comitato Geologico d'Italia, Biblioteca N. Centrale Vittorio Emanuele and Prof. Guiseppi Sergi of Rome; Accademia Reale delle Scienze and Observatorio R. Universitá, Turin; R. Istituto Veneto di Scienze Lettere ed Arti; Académie Royale de Belgique, Musée Royale d'Historie Naturelle and Prof. Albrecht, Brussels; K. Universitet, Lund; Société de Géographie, Institution Ethnographique, Société d'Anthropologie, Société des Antiquaires de France, Musée Guimet, École des Mines, Revue Internationale de l'Enseignement, Ministre de l'Instruction Publique and Marquis de Nadaillac, Paris; Société des Sciences Physiques et Naturelles, Bordeaux; Société Séricicole, Montpellier; R. Academia de Ciencias Naturales y Artes, Barcelona; R. Academia de la Historia, Madrid; Instituto y Observatorio de Marina (San Fernando); Royal Society, Linnean, Zoological, Geological and Statistical Societies, Royal Geographical and Astronomical Societies, Meteorological Society and Office, Society of Antiquaries, Victoria Institute, "Nature," Journals of Conchology and Forestry and Dr. Benjamin Ward Richardson of London; Cambridge Philological Society; Royal Cornwall Polytechnic Society, Falmouth; Philosophical and Literary Society of Leeds; Royal Dublin Society and Royal Geological Society of Ireland; Nova Scotian Institute of Natural Science; "The Canadian Record of Science," Montreal; Dr. Robert Bell, Ottawa; Literary and Historical Society, Quebec; Canadian Institute, Toronto; Military Academy,

Norwich, Vt.; Mt. Pleasant Classical Institution; Boston Society of Natural History, Massachusetts Historical Society, American Statistical Association, Mr. H. Andrews Hill and the editor of "Library Notes," Boston; Harvard College, Museum of Comparative Zoölogy and Prof. Samuel H. Scudder, Cambridge, Mass.; Essex Institute; "American Journal of Science," College and Oriental Society, New Haven; Entomological Yale Society and Brooklyn Library; Buffalo Library; American Chemical Society and Meteorological Observatory, New York; Vassar Brothers' Institute, Poughkeepsie; Geological Survey of New Jersey; editor of the "Philosophian Review," Bridgeton; College of Pharmacy, Franklin Institute, Historical Society of Pennsylvania, Mercantile Library, Pennsylvania Society for Promotion of Public Economy, Academy of Natural Sciences, Philadelphia Library, Provident Life and Trust Co., Philadelphia Panorama Co., Messrs. S. C. Perkins, Fr. Meinert, Celen Sabbrin, W. S. Baker, R. S. Culin, Henry Phillips, Jr., and McCalla & Stavely, Philadelphia; Wyoming Historical and Geological Society; U.S. Naval Institute, Annapolis; Johns Hopkins University and American Journal of Philology, American Chemical Journal, American Journal of Archæology, Peabody Institute, Baltimore; U. S. Fish Commission, U. S. National Museum, U. S. Geological Survey, U. S. Naval Observatory, National Academy of Sciences, U. S. Government Publications Bureau of Education, Hydrographic Office, Departments of Interior and of State, Virginia Historical Society; Leander McCormick Observatory; Society of Natural History, Cincinnati; Transylvania University; Mr. Charles C. Jones, Jr., of Augusta; Society of Natural History, Brookville, Ind.; Rev. Stephen D. Peet, Chicago; Prof. H. S. Frieze, Ann Arbor; Mr. T. F. Williams, St. Paul; Academy of Natural Sciences, Davenport, Ia.; State Historical Society, Iowa City; Washburn College and Kansas Historical Society, Topeka; Prof. Chas. W. Brooks, San Francisco; Colorado Scientific Society; Dr. Antonio Peñafiel, Mexico; Prof. L. Darapsky, Santiago; Imperial Observatorio, Museo Nacional and Prof. Ladislau Netto, Rio de Janeiro.

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The Secretaries reported that they had communicated with various foreign and domestic societies and periodicals in referende to an exchange of publications, and that the following so far had responded favorably, viz:

La Société de Borda, Dax, France; Geographische Gesellschaft, Hannover; Académie de Belles Lettres, Caen, France; R. Accademia degli Agiati, Roveredo, Austria; R. Academia de Ciencias, Barcelona, Spain; Société Sericicole, Montpellier, France; Société des Antiquaires de la Marne, St. Omer, France; Naturforscher, Tübingen, Germany; Cosmos, Paris, France; Verein für Thüringische Geschichte, Jena; Société des Amis des Sciences Naturelles et d'Ethnographie, Moscow, Russia; Société des Sciences et de Geographie, Port-au-Prince; K. Zoolog. Genootschap, Hague; R. Accademia di Scienze, Padova; Soc. Historique et Litt. du Cher, Bourges; Garten-Bau Verein, Darmstadt; Naturwissenschaftliche Gesellschaft, Dresden; La Société Polymathique de Morbihan, Vannes, France.

On motion, the above societies, &c., were placed upon the exchange list to receive Proceedings from No. 96.

La Société Malocologique de Belgique, Bruxelles, requested certain volumes of Transactions, which were ordered to be sent, and that the Society should receive them as published hereafter.

Pending nomination No. 1113 was read.

Mr. Phillips exhibited a photograph of Mt. Ætna in eruption, on May 20, 1886, at 1.30 P.M.

On motion, of Mr. Law, the Society appropriated $100 for the mounting on guards and binding the MS. letters of William Temple Franklin, lately found in the Society's attics.

On motion of Mr. Jordan, the Society agreed to dispense with the meeting of September 17th, and the Society was adjourned by the presiding member.

*Stated Meeting, October 1, 1886.*

Present, 15 members.

President, Mr. FRALEY, in the Chair.

Mr. W. S. Baker, a newly-elected member, was presented to the Chair and took his seat.

Letters of envoy were received from the Meteorological Office and Statistical Society of London; American Academy of Arts and Sciences, Boston; Boston Society of Natural History; Observatorio Nacional, Córdova, Argentine Republic.

Letters of acknowledgment were received from L' Acadèmie Royale Danoise des Sciences et des Lettres, Copenhagen (120, 121); Royal Society of London (121); Boston Society of Natural History (119–122); Natural History Society, Montreal, Canada (123); Institut Canadian-Français, Ottawa, Canada (123); Canadian Institute, Toronto, Canada (123); Historical and Scientific Society of Manitoba, Winnipeg, Canada (123); Portland Society of Natural History, Maine (123); New Hampshire Historical Society, Concord (123); Museum of Comparative Zoölogy, Prof. Alexander Agassiz, Mr. Robert N. Toppan, Cambridge, Mass. (123); Essex Institute, Salem (123); American Antiquarian Society, Worcester, Mass. (123); Rhode Island Historical Society, Providence (123); Connecticut Historical Society, Hartford (123); University of the City of New York, New York Historical Society, Prof. Henry M. Baird, Prof. J. J. Stevenson, New York (123); Prof Walter LeConte Stevens, Brooklyn, N. Y. (123); Prof. C. H. F. Peters, Clinton, N. Y. (123); U. S. Military Academy, West Point, N. Y. (123); New Jersey Historical Society, Newark (123); Numismatic and Antiquarian Society, Mr. Thomas M. Cleemann, Prof. J. Solis Cohen, Mr. Patterson DuBois, Prof. James W. Holland, Mr. W. W. Jefferis, Prof. John M. Maisch, Dr. Chas. A. Oliver, Mr. Henry Phillips, Jr., Mr. Thos. N. Walter, Philadelphia (123); Rev. J. A. Murray, Carlisle, Pa. (123); Prof. M. H. Boyé, Coopersburg, Pa. (123); Profs. Traill Green and J. W. Moore, Easton, Pa. (123); Lack-

awanna Institute of History and Science, Scranton, Pa. (123); Wyoming Historical and Geological Society, Wilkes-Barre, Pa. (123); U. S. Naval Institute, Annapolis, Md. (123); Maryland Institute, Baltimore, Md. (123); Prof. J. H. C. Coffin, Messrs. W. B. Taylor and Chas. A. Schott, Washington, D. C. (123); Leander McCormick Observatory, University of Virginia (123); Prof. M. Schele De Vere, University of Virginia (123); Virginia Historical Society, Richmond, Va. (123); Elliott Society, Charleston, S. C. (123); Georgia Historical Society, Savannah (123); Cincinnati Observatory, Prof. J. M. Hart, Cincinnati, O. (123); Dennison University, Granville, O. (123); Rev. H. S. Osborn, Oxford, O. (123); Prof. Robt. Peter, Lexington, Ky. (123); State University Library, Prof. Daniel Kirkwood, Bloomington, Ind. (123); Chicago Historical Society, Illinois (123); Rantoul Literary Society, Illinois (123); Davenport Academy of Natural Sciences, Iowa (123); State Historical Society of Wisconsin, Madison (123); Kansas State Historical Society, Topeka (123); University of California, Profs. John and Joseph LeConte, Berkeley, Cal. (123); Prof. George Davidson, San Francisco, Cal. (123).

Letters of acknowledgment for the list of surviving members of the American Philosophical Society were received from New Hampshire Historical Society, Concord; Massachusetts Historical Society, Boston; Prof. H. A. Hagan, Mr. Robert N. Toppan, Cambridge, Mass.; Essex Institute, Salem, Mass.; American Antiquarian Society, Worcester, Mass.; Rhode Island Historical Society, Providence; Connecticut Historical Society, Hartford; New York Historical Society, Astor Library, New York; Buffalo Library, Buffalo, N. Y.; U. S. Military Academy, West Point, N. Y.; New Jersey Historical Society, Newark; Mr. Patterson DuBois, Dr. James W. Holland, Dr. Charles A. Oliver, Mr. Robert Patterson, Rev. J. W. Robins, Philadelphia; Prof. J. W. Moore, Easton, Pa.; Lackawanna Institute of History and Science, Scranton, Pa.; Wyoming Historical and Geological Society, Wilkes-Barrè, Pa.; Prof. M. Schele DeVere, University of Virginia; Georgia Historical So-

ciety, Savannah; Chicago Historical Society, Illinois; State Historical Society of Wisconsin, Madison; Kansas State Historical Society, Topeka; University of California, Berkeley, Cal.

Letters accepting membership in the Society were read from Prof. Merrill E. Gates (Rutgers' College, New Brunswick, New Jersey, September 27th, 1886); Prof. J. P. Postgate (Trinity College, Cambridge, England, September 4th, 1886).

La Société Littéraire Finnoise and the University of Illinois requested by letter to receive the Society's Proceedings. On motion, they were ordered to be placed on the list to receive Proceedings from No. 96.

The following societies were placed on the exchange list and ordered to receive Proceedings from No. 96:

Verein für Thüringische Geschichte und Alterthumskunde, Jena; Berliner Anthropologische Gesellschaft; Berliner Gesell. für Erdkunde; Maatschappij der Nederlandsche Letterkunde, Leiden.

Donations for the Library were reported from the following: Deutsche Gesellschaft für Anthropologie, Munich; Acadèmie Royale de Copenhagen; Prof. Giuseppi, Sergi-Rome; R. Osservatorio di Torino; La Société d' Histoire de France; d' Anthropologie de Paris; de Zoologie de France; Revue Internationale de L' Enseignement, Institut de France, Paris; Société d' Agriculture de Lyon; Acadèmie Nationale des Sciences, Belles-Lettres et Arts, Bordeaux; Royal Society, British Association for the Advancement of Science, Royal Geographical Society, London; Boston Society of Natural History, Boston Athenæum, American Academy of Arts and Sciences, Boston; Prof. Edward C. Pickering, Cambridge, Mass.; Essex Institute, Salem; Yale College, New Haven; New York Meteorological Observatory; Messrs. R. S. Culin, Philip H. Law, Henry Phillips, Jr., Philadelphia; Johns Hopkins University, "American Chemical Journal," "American Journal of Philology," Baltimore; U. S. National Museum, National Academy of Sciences, Entomological Society, Departments of the Interior, State and War Department, Hydrographic Office, Washington, D. C.; Rev. Stephen D. Peet,

Chicago; California Academy of Sciences; Observatorio Nacionale Argentino, Buenos Ayres; Observatorio do Rio de Janeiro.

Photographs for the Society's Album were received from the following members: Charles A. Ashburner, Philadelphia; Thomas M. Drown, Boston; Thomas H. Dudley, Camden; Wm. W. Keen, Philadelphia; John M. Maisch, Philadelphia.

The following deaths of members at Philadelphia were announced: Dillwyn Parrish, September 18th, 1886, aged 77 years; James R. Ludlow, September 20th, 1886, aged 62 years; and, on motion, the President was authorized to appoint suitable persons to prepare the usual obituary notices.

Dr. Charles A. Oliver read a paper on "Subjective After-Color" (Complementary Color).

Dr. Daniel G. Brinton read a paper on "Ikonomatic Nomenclature."

Mr. Thomas H. Dudley read a paper, "Is there reciprocity in trade and the consumption of manufactured commodities?"

Prof. E. D. Cope presented a paper, "A systematic list of the North American species of Bufo and Rana, with descriptions of some new species of Batrachia from the specimens in the National Museum."

Pending nomination No. 1113 was read, and the Society was adjourned by the President.

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*Stated Meeting, October 15, 1886.*

Present, 15 members.

President, Mr. FRALEY, in the Chair.

Prof. Benjamin Sharp, M.D., a newly-elected member, was presented to the Chair and took his seat.

Letters of envoy were received from the Zoölogical Society of London; University of Illinois; U. S. Geological Survey, Washington, D. C.; Hamilton Association, Canada; Harvard College Observatory.

Letters of acknowledgment were received from the University of Illinois (96–123); Historical Society of Pennsylvania (123); Dr. William G. A. Bonwill and Mr. Samuel Dickson of Philadelphia (123); Mr. Richard Meade Bache (123).

The State Library of Massachusetts (Boston), the K. Sächs. Alterthumsverein, Dresden, and the Observatoire Astronomique et Physique of Tashkend, Turkestan, Russia, were placed on the list to receive the Proceedings of the Society, beginning with No. 96.

Donations to the Library were announced from the following: Mining Department, Melbourne; China Branch of the Royal Asiatic Society, Shanghai; Société de Littéraire Finnoise, Helsingfors; K. K. Sternwarte, Prag; Prof. G. vom Rath, Bonn; "Astronomische Nachrichten," Kiel; "Zoölogischer Anzeiger," Leipsic; Société Royale des Antiquaries du Nord, Copenhagen; K. Zoölogisch-Botanisch Genootschap, 'S-Gravenhage; Société de Géographie and Prof. Pedro A. Monteiro, Lisbon; Royal Society and "Nature," London; Natural History and Antiquarian Society, Penzance; Hamilton Association, Ontario, Canada; Boston Society of Natural History; Harvard College Observatory; "American Journal of Science," New Haven; Messrs. E. Steiger & Co., New York; New Jersey Historical Society; Franklin Institute, Hydrographic Office, College of Pharmacy, American Catholic Historical Society, Messrs. A. E. Foote, Isaac Myer, Philip H. Law, Henry Phillips, Jr., Gen. Russell Thayer and Dr. I. Minis Hays, of Philadelphia; Wyoming Historical and Geological Society, Wilkes-Barrè; Naval Observatory, Department of State, U. S. National Museum, Smithsonian Institution and Government Printing Office, Washington, D. C.; Illinois University, Champlain; University of California, Berkeley, Cal.

Mr. Alvan Clark, of Cambridgeport, Mass., presented his photograph for the Society's Album, and Mr. W. S. Baker, of Philadelphia, an etched likeness of himself.

Mr. William Harden, Savannah, Ga., presented a photograph of an Indian vase, lately exhumed in Georgia.

Action on proposition No. 1113 was postponed until December 17th.

Prof. Cope exhibited some crania of Tahitians and made remarks on human dentition, after which a discussion ensued, participated in by Drs. Horn and J. Cheston Morris.

The President reported he had received and paid over to the Treasurer the Michaux rentes for July, $133.07.

On motion, the Society subscribed to the "Journal of Morphology."

And the Society was adjourned by the President.

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## *The Conception of Love in some American Languages.*

*By Daniel G. Brinton, M.D.*

(*Read before the American Philosophical Society, Nov. 5, 1886.*)

"The words which denote love, describing a sentiment at once powerful and delicate, reveal the inmost heart of those who created them. The vital importance attached to this sentiment renders these beautiful words especially adapted to point out the exceeding value of language as a true autobiography of nations."

This quotation is from an essay by a thoughtful writer, Dr. Carl Abel, in which he has gathered from four languages, the Latin, English, Hebrew and Russian, their expressions for this sweet emotion, and subjected them to a careful analysis.* The perusal of his article has led me to make some similar examinations of American languages; but with this difference in method, that while Dr. Abel takes the languages named in the fullness of their development and does not occupy himself with the genesis of the terms of affection, I shall give more particular attention to their history and derivation as furnishing illustrations of the origin and growth of those altruistic sentiments which are revealed in their strongest expression in the emotions of friendship and love.

Upon these sentiments are based those acts which unite man

* *Linguistic Essays*, by Carl Abel, Ph.D. (London, 1882).

to man in amicable fellowship and mutual interchange of kindly offices, thus creating a nobler social compact than that which rests merely on increased power of defence or aggression. These sentiments are those which bind parent to child and child to parent, and thus supply the foundation upon which the family in the true significance of the term should rest. These are they which, directed toward the ruler or the state, find expression in personal loyalty and patriotic devotion. Surpassing all in fervor and potency, these sentiments, when exhibited in love between the sexes, direct the greater part of the activity of each individual life, mould the forms of the social relations, and control the perpetuation of the species. Finally, in their last and highest manifestations, these sentiments are those which have suggested to the purest and clearest intellects both the most exalted intellectual condition of man, and the most sublime definition of divinity.* These are good reasons, therefore, why we should scan with more than usual closeness the terms for the conception of love in the languages of nations.

Another purpose which I shall have in view will be to illustrate by these words the wonderful parallelism which everywhere presents itself in the operations of the human mind, and to show how it is governed by the same associations of ideas both in the new and old worlds.

As a preparation for the latter object, let us take a glance at the derivation of the principal words expressing love in the Aryan languages. The most prominent of them may be traced back to one of two ruling ideas, the one intimating a similarity or likeness between the persons loving, the other a wish or desire. The former conveys the notion that the feeling is mutual, the latter that it is stronger on one side than on the other.

These diverse origins are well illustrated by the French *aimer* and the English *love*. *Aimer*, from the Latin *amare*, brings us to the Greek *αμα*, *ομος*, both of which spring from the Sanscrit *sam;* from which in turn the Germans get their words *sammt*, along with, and *zusammen*, together; while we obtain from this root almost without change our words *similar* and *same*. Ety-

*I scarcely need say that I refer to the marvelous words of St. John: *ὁ μη αγαπων, ουκ εγνω τον Θεον, οτι ὁ Θεος αγαπη εστιν* (1 John iv, 8); and to the *amor intellectualis*, the golden crown of the philosophy of Spinoza as developed in the last book of his *Ethica*.

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mologically, therefore, those who love are alike; they are the *same* in such respects that they are attracted to one another, on the proverbial principle that "birds of a feather flock together."

Now turning to the word *love*, German *Liebe*, Russian *lubov*, *lubity*, we find that it leads us quite a different road. It is traced back without any material change to the Sanscrit *lobha*, covetousness, the ancient Coptic λιβε, to want, to desire. In this origin we see the passion portrayed as a yearning to possess the loved object; and in the higher sense to enjoy the presence and sympathy of the beloved, to hold sweet communion with him or her.

A class of ideas closely akin to this are conveyed in such words as "attached to," "attraction," "affection," and the like, which make use of the figure of speech that the lover is fastened to, drawn toward, or bound up with the beloved object. We often express this metaphor in full in such phrases as "the bonds of friendship," etc.

This third class of words, although in the history of language they are frequently of later growth than the two former, probably express the sentiment which underlies both these, and that is a dim, unconscious sense of the unity which exists throughout all objective nature, a unity which is revealed to man most perfectly in the purest and highest love, which at its sublimest height does away with the antagonism of independent personality and blends the *I* and the *Thou* in a oneness of existence.

Although in this, its completest expression, we must seek examples solely between persons of opposite sex, it will be well to consider in an examination like the present, the love between men, which is called friendship, that between parents and children, and that toward the gods, the givers of all good things. The words conveying such sentiments will illustrate many features of the religious and social life of the nations using them.

## *I. The Algonkin.*

I begin with this group of dialects, once widely spread throughout the St. Lawrence valley and the regions adjoining; and among them I select especially the Cree and the Chipeway, partly because we know more about them, and partly because they probably represent the common tongue in its oldest and

purest type. They are closely allied, the same roots appearing in both with slight phonetic variations.

In both of them the ordinary words for love and friendship are derived from the same monosyllabic root, *sak*. On this, according to the inflectional laws of the dialects, are built up the terms for the love of man to woman, a lover, love in the abstract, a friend, friendship, and the like. It is also occasionally used by the missionaries for the love of man to God and of God to man.*

In the Chipeway this root has but one form, *sagi;* but in Cree it has two, a weak and a strong form, *saki* and *sakk*. The meaning of the latter is more particularly to fasten to, to attach to. From it are derived the words for string or cord, the verbs, "to tie," "to fasten," etc.; and also some of the coarsest words to express the sexual relation.† Both these roots are traced back to the primary element of the Algonkin language expressed by the letters *sak* or *s—k*. This conveys the generic notion of force or power exerted by one over another,‡ and is apparently precisely identical with the fundamental meaning of the Latin *afficio*, "to affect one in some manner by active agency,"§ from which word, I need hardly add, were derived *affectus* and *affectio* and our "affection;" thus we at once meet with an absolute parallelism in the working of the Aryan Italic and the American Algonkin mind.

The Cree has several words which are confined to parental and filial love and to that which the gods have for men. These are built up on the dissyllabic radical *espi* or *aspi*, which is an instrumental particle signifying "by means of, with the aid of."‖ Toward the gods, such words refer to those who aid us; toward children those whom their parents aid; and from children toward parents, again those from whom aid is received.

*Chipewa: *nin sagiiwe*, I love; *sagiiwewin*, love; *saiagiiwed*, a lover.

Cree: *sâkihitowin*, friendship; *manitowi sâkihewewin*, the love of God. The words from the Chipeway are from Baraga's *Otchipwe Dictionary*; those from the Cree from Lacombe's *Dictionnaire de la langue des Cris*, except when otherwise noted.

†Chipeway: *sagibidjigan*, a string or cord.

Cree: *sakkappitew*, he fastens, he ties; *sakkahigan*, a nail; *sakkistiwok*, coeunt, copulati sunt.

‡See Joseph Howse, *Grammar of the Cree Language*, p. 165.

§See the remarks in Andrews' *Latin Lexicon*, *s. v.*

‖Cree: *espiteyimit kije-manito*, for the love of God; *espiteyimatijk*, for the love of the children.

For love between men, friendship, the Cree employs some words from the radical *sâki;* but more frequently those compounded with the root *wit* or *witch*, which means "in company with,"* and is the precise analogue of the syllable *com* (Latin, *con*) in the English words companion, comrade, compeer, confederate, etc.; it conveys the idea of association in life and action, and that association a voluntary and pleasure-giving one.

In the Chipeway there is a series of expressions for family love and friendship which in their origin carry us back to the same psychological process which developed the Latin *amare* from the Sanscrit *sam* (see above). They may be illustrated by the melodious term which in that dialect means both friendship and relationship, *inawendawin*. This is an abstract verbal noun from the theme *ni inawa*, I resemble him, which is built up from the radicle *in*. This particle denotes a certain prevailing way or manner, and appears both in Cree and Chipeway in a variety of words.† The principle of similarity is thus fully expressed as the basis of friendship. To see how apparent this is we have but to remember the English "I like him," *i. e.*, there is something in him *like* me.

The feebler sentiment of merely liking a person or thing is expressed in the Chipeway by a derivative from the adjective *mino*, good, well, and signifies that he or it seems good to me.‡

The highest form of love, however, that which embraces all men and all beings, that whose conception is conveyed in the Greek αγαπη, we find expressed in both the dialects by derivatives from a root different from any I have mentioned. It is in its dialectic forms *kis*, *keche*, or *kiji*, and in its origin it is an intensive interjectional expression of pleasure, indicative of what gives joy.§ Concretely it signifies what is completed, permanent, powerful, perfected, perfect. As friendship and love yield the most exalted pleasure, from this root the natives drew a fund of words to express fondness, attachment, hospitality, charity;

*Cree: *ni wîjiwâgan*, my friend; *witchettuwin*, a confraternity, or society.

†Chipeway: *inawema*, I am his relative, or, his friend.

Cree: *ijinâkusiw*, he has such an appearance. This particle of similarity is considered by Howse to be "one of the four primary generic nouns" of the Algonkin language. *Grammar of the Cree Language*, p. 135.

‡Chipeway: *nin minenima*, I like (him, her, it).

§See Howse, *Grammar of the Cree Lang.*, p. 175. *Keche* (*kees*) as an interjection of pleasure, he considers in antithesis to *ak* (compare German *ach!*) as an interjection of pain, and cites abundant examples.

and from the same worthy source they selected that adjective which they applied to the greatest and most benevolent divinity.*

## *II. The Nahuatl.*

The Nahuatl, Mexican or Aztec language was spoken extensively throughout Mexico and Central America, and every tribe who used it could boast of a degree of culture considerably above that of any of the Algonkin communities. Such being the case, it is rather surprising to note how extremely poor in comparison is the Nahuatl in independent radicals denoting love or affection. In fact, there is only one word in the language which positively has this signification, and it, with its derivatives, is called upon to express every variety of love, human and divine, carnal and chaste, between men and between the sexes.

This word is *tlazótla*, he loves. It is no easy matter to trace its history. By well known laws of Nahuatl etymology we know that the root is *zo*. We have from this same root several other words of curiously diverse meanings. Thus, *izo*, to bleed, to draw blood, either for health, or, as was the custom of those nations, as a sacrifice before the idols; *izoliui*, to grow old, to wear out, applied to garments; *tlazoti*, to offer for sale at a high price; and *zozo*, to string together, as the natives did flowers, peppers, beads, etc. Now, what idea served as the common starting-point of all these expressions? The answer is, that we find it in the word *zo* as applied to a sharp-pointed instrument, a thorn, or a bone or stone awl, used in the earliest times for puncturing or transfixing objects. From this came *zozo*, to transfix with such an instrument and string on a cord; *izoliui*, to be full of holes as if repeatedly punctured and thus worn out; and *izo*, to bleed, because that was done by puncturing the flesh with the thorns of the maguey or sharp obsidian points.†

*Chipeway: *nin kijewadis*, I am amicable, benevolent; *kijewadisiwin*, charity, benevolence, benignity, compassion; *kije manitowin*, Godhead, divine nature.

Cree: *kisatew*, he is devoted to (him, her); *kisew*, she loves (her children); *kisewatisiwin*, charity, the highest virtue; *kise manito*, "l'esprit charitable, Dieu," and numerous others.

†The following words and meanings are from Carochi's Grammar and Molina's Dictionary of this tongue:

*ço*, punzar, sangrar.

*çoço*, ensartar, como flores, cuentas, etc.

*çotica*, estar ensartada la cuenta, etc.

*tlaçotl*, cosa ensartada.

The original meaning of *zo*, a pointed tool or awl, is not given by Molina, but is repeatedly expressed in the phonetic picture writing of the Aztecs.

But how do we bring these into connection with the sentiment of love and its verbal expression? We might indeed seek an illustration of the transfer from classical mythology, and adduce the keen-pointed arrows of Cupid, the darts of love, as pointing out the connection. But I fear this would be crediting the ancient Nahuas with finer feelings than they deserve. I gravely doubt that they felt the shafts of the tender passion with any such susceptibility as to employ this metaphor. Much more likely is it that *tlazótla*, to love, is derived directly from the noun *tlazôtl*, which means something strung with or fastened to another. This brings us directly back to the sense of "attached to" in English, and to that of the root *saki* in Algonkin, the idea of being bound to another by ties of emotion and affection.

But there is one feature in this derivation which tells seriously against the national psychology of the Nahuas: this their only word for love is not derived, as is the Algonkin, from the primary meaning of the root, but from a secondary and later signification. This hints ominously at the probability that the ancient tongue had for a long time no word at all to express this, the highest and noblest emotion of the human heart, and that consequently this emotion itself had not risen to consciousness in the national mind.

But the omissions of the fathers were more than atoned for by the efforts of their children. I know no more instructive instance in the history of language to illustrate how original defects are amended in periods of higher culture by the linguistic faculty than this precise point in the genesis of the Nahuatl tongue. The Nahuas, when they approached the upper levels of emotional development, found their tongue singularly poor in radicals conveying such conceptions. As the literal and material portions of their speech offered them such inadequate means of expression, they turned toward its tropical and formal portions, and in those realms reached a degree of development in this direction which far surpasses that in any other language known to me.

In the formal portion of the language they were not satisfied with one, but adopted a variety of devices to this end. Thus: all verbs expressing emotion may have an intensive termination suffixed, imparting to them additional force; again, certain prefixes indicating civility, respect and affection may be employed

in the imperative and optative moods; again, a higher synthetic construction may be employed in the sentence, by which the idea expressed is emphasized, a device in constant use in their poetry; and especially the strength of emotion is indicated by suffixing a series of terminations expressing contempt, reverence or love. The latter are wonderfully characteristic of Nahuatl speech. They are not confined to verbs and nouns, but may be added to adjectives, pronouns, participles, and even to adverbs and postpositions. Thus every word in the sentence is made to carry its burden of affection to the ear of the beloved object!

Add to these facilities the remarkable power of the Nahuatl to impart tropical and figurative senses to words by the employment of rhetorical resources, and to present them as one idea by means of the peculiarities of its construction, and we shall not consider as overdrawn the expression of Professor De la Rosa when he writes: "There can be no question but that in the manifestation in words of the various emotions, the Nahuatl finds no rival, not only among the languages of modern Europe, but in the Greek itself."*

The Nahuatl word for friendship is *icniuhtli*. This is a compound of the preposition *ic*, with; the noun-ending *tli;* and the adverbial *yuh*, or *noyuh*, which means "of the same kind." The word, therefore, has the same fundamental conception as the Latin *amicus* and the Cree *inawema*, but it was not developed into a verbal to express the suffering of the passion itself.†

### *III. The Maya.*

The whole peninsula of Yucatan was inhabited by the Mayas, and tribes speaking related dialects of their tongue lived in Guatemala, Chiapas, and on the Gulf Shore north of Vera Cruz. All these depended chiefly on agriculture for subsistence, were builders of stone houses and made use of a system of written records. Their tongue, therefore, deserves special consideration as that of a nation with strong natural tendencies to development.

In turning to the word for love in the Maya vocabulary we are

* *Estudio de la Filosofia y Riqueza de la Lengua Mexicana.* Par Agostin de la Rosa, p. 78 (Guadalajara, 1877).

† There is another word in Nahuatl of similar derivation. It is *pohui*, to make much of a person, to like one. The root is *po*, which carries with it the idea of sameness, similarity or equality; as *itelpocapo*, a boy like himself. (Paredes, *Promptuario Manual Mexicano*, p. 140.)

at once struck with the presence of a connected series of words expressing this emotion, while at the same time they, or others closely akin to them and from the same root, mean pain, injury, difficulty, suffering, wounds and misery. Both are formed by the usual rules from the monosyllable *ya*.* Were the ancient Mayas so sensitive to love's wounds and the pangs of passion as to derive their very words for suffering from the name of this sentiment?

No; that solution is too unlikely for our acceptance. More probable is it that we have here an illustration of the development of language from interjectional cries. In fact, we may be said to have the proof of it, for we discover that this monosyllable *ya* is still retained in the language as a verb, with the signification "to feel anything deeply, whether as a pain or as a pleasure."† Its derivatives were developed with both meanings, and as love and friendship are the highest forms of pleasure, the word *ya* in its happier senses became confined to them.

It seems to have sufficed to express the conception in all its forms, for the writers in the language apply it to the love of the sexes, to that between parents and children, that among friends, and also to that which men feel toward God, and that which He is asserted to feel toward men.‡

The Mayas, therefore, were superior to the Nahuas in possessing a radical word which expressed the joy of love; and they must be placed above even the early Aryans in that this radical was in significance purely psychical, referring strictly to a mental state, and neither to similarity nor desire.

It is noteworthy that this interjectional root, although belong-

* Thus:
*ya* or *yail*, love; pain, sickness, a wound; difficult, laborious,
*yate*, to love.
*yacunah*, to love.
*yaili*, painfully, laboriously.
*yalal*, to taste; to have relations with a woman.
*yatzil*, love, charity; something difficult or painful.

† "*ya*: sentir mucho una cosa.
*yamab*: sin sentir [the *ma* is the negative].
*Diccionario Maya-Español del Convento de Motul.* (MS. in my possession)

‡ Thus:
*yahtetabal cah tumen Dios*, we are loved by God.
*u yacunah Dios toon*, the love of God to us.
*yacunahil Dios*, the love with which God is loved.
*mehenbil yacunah*, filial love.
*bakil yacunah*, carnal love.
All from the *Diccionario de Motul* (MS.).

ing to the substructure of the language, does not appear with the meaning of love in the dialects of the Maya stock. In them the words for this sentiment are derived from other roots.

Thus among the Huastecas, residing on the Gulf of Mexico, north of Vera Cruz, the word for love is *canezal*. It is employed for both human and divine love, and also means anything precious and to be carefully guarded as of advantage to the possessor.* There is no difficulty in following its development when we turn to the Maya, which preserves the most numerous ancient forms and meanings of any dialect of this stock. In it we discover that the verb *can* means "to affect another in some way, to give another either by physical contact or example a virtue, vice, disease or attribute."† Here again we come upon the precise correlative of the Latin *afficio*, from which proceeds our "affection," etc.

The Guatemalan tribes, the principal of which were and are the Quiches and Cakchiquels, did not accept either *ya* or *can* as the root from which to build their expressions for the sentiment of love. In both these dialects the word for to love is *logoh*. It also means "to buy," and this has led a recent writer to hold up to ridicule the Spanish missionaries who chose this word to express both human and divine love. Dr. Stoll, the writer referred to, intimates that it had no other meaning than "to buy" in the pure original tongue, and that the only word for the passion is *ah*, to want, to desire.‡ In this he does not display his usual accuracy, for we find *logoh* used in the sense "to like," "to love," in the *Annals of the Cakchiquels*, written by a native who had grown to manhood before the Spaniards first entered his country.§

* Thus:

*latu canel ixallè*, my beloved wife.

*ma a canezal a Dios*, dost thou love God?

*Diccionario Huasteco Español*, por Carlos de Tapia Zenteno (Mex., 1767).

† A number of examples are given in the *Diccionario de Motul* (MS.).

‡ "Der blosse Begriff derjenigen Liebe, welche das lateinische Zeitwort *amare* ausdrückt, dem Cakchiquel Indianer fremd ist" *Zur Ethnographie der Republik Guatemala*. Von Otto Stoll, M.D., p. 146 (Zurich, 1884).

§ *Xelogox ka chiri ruma Akahal vinak*, "they were loved by the Akahal men." *Annals of the Cakchiquels*, p. 126 (Vol. VI of Brinton's Library of Aboriginal American Literature). In the Quiche *Popol Vuh* the word has the same meaning as (page 102):

*chi log u vach*, their beloved face.

In fact, the word Dr. Stoll gives as that now usual among the Cakchiquels for "to love"=to desire, in the *Popol Vuh* is applied to the price paid for wives (p. 304):

*rahil pu mial*, the price of their daughters.

This word may be a derivative from the Maya *ya*, above mentioned.

That the verb *logoh* means, both in origin and later use, "to buy," as well as "to love," is undoubtedly true. Its root *logh* is identical with the Maya *loh*, which has the meanings "to exchange, to buy, to redeem, to emancipate." It was the word selected by the Franciscan missionaries to express the redemption of the world by Christ, and was applied to the redemption of captives and slaves. It might be suggested that it bears a reference to "marriage by purchase;" but I think that "to buy," and "to love," may be construed as developments of the same idea of *prizing highly*. When we say that a person is *appreciated*, we really say that he has had a proper price put upon him. The Latin *carus*, which Cicero calls *ipsum verbum amoris*,* means costly in price as well as beloved; and the tender English "dear" means quite as often that the object is expensive to buy, as that we dote very much upon it. Nor need we go outside of American languages for illustrations; in Nahuatl *tlazóti* means to offer for sale at a high price, and in Huasteca *canel*, from the same root as *canezal*, to love, means something precious in a pecuniary sense, as well as an object of the affections. Other instances will present themselves when we come to examine some of the South American tongues. But from what I have already given, it is evident that there is nothing contradictory in the double meaning of the verb *logoh*.

### *IV. The Qquichua.*

The ancient Peruvians who spoke the Qquichua language had organized a system of government and a complex social fabric unsurpassed by any on the continent. The numerous specimens of their arts which have been preserved testify strongly to the licentiousness of their manners, standing in this respect in marked contrast to the Aztecs, whose art was singularly pure. It must be regarded as distinctly in connection with this that we find a similar contrast in their languages. We have seen that in the Nahuatl there appears to have been no word with a primary signification "to love," or any such conception. The Qquichua, on the contrary, is probably the richest language on the continent, not only in separate words denoting affection, but in modifications of these by imparting to them delicate shades

* *De Naturâ Deorum*, I, 44.

of meaning through the addition of particles. As an evidence of the latter, it is enough to cite the fact that Dr. Anchorena in his grammar of the tongue, sets forth nearly six hundred combinations of the verb *munay*, to love!*

The Qquichua is fortunate in other respects; it has some literature of its own, and its structure has been carefully studied by competent scholars. It is possible, therefore, to examine its locutions in a more satisfactory manner than is the case with most American languages. Its most celebrated literary monument is the drama of *Ollanta*, supposed to have been composed about the time of the conquest. It has been repeatedly edited and translated, most accurately by Pacheco Zegarra.† His text may be considered as the standard of the pure ancient tongue.

Of Qquichua words for the affections that in widest use is the one above quoted, *munay*. It is as universal in its application as its English equivalent, being applied to filial and parental love as well as to that of the sexes, to affection between persons of the same sex, and to the love of God. No other word of the class has such a wide significance. It ranges from an expression of the warmest emotion down to that faint announcement of a preference which is conveyed in the English "I should prefer."‡

On looking for its earlier and concrete sense we find that *munay* expressed merely a sense of want, an appetite and the accompanying desire of satisfying it, hence the will, or the wish, not subjectively, but in its objective manifestation. § Therefore it is in origin nearly equivalent to the earliest meaning of "love," as seen in the Sanscrit and the Coptic.

While *munay* is thus to love on reasonable grounds and with definite purpose, blind, unreasoning, absorbing passion is ex-

* *Gramática Quechua*, por Dr. J. D. Anchorena, pp. 163–177 (Lima, 1874).

† *Ollanta: Drame en vers Quechuas du Temps des Incas.* Traduit et commenté par Gavino Pacheco Zegarra, (Paris, 1878).

‡ Thus, from the *Ollanta:*

*Ollantaytan munarccanqui*, thou lovest Ollanta! (line 277).

*munacuscallay*, my well beloved! (the Inca to his daughter, line, 311).

*munayman*, I should prefer (line 1606).

Holguin, in his *Vocabulario de la Lengua Qquichua*, gives:

*Dios munay*, the love of God.

*munaricuy*, unchaste love.

§ Holguin (u. s.) gives the definitions:

*munana*, la voluntad que es potentia.

*munay*, voluntad, el querer, el gusto, appetito ó amor que es acto.

pressed by *huaylluni*. This is nearly always confined to sexual love, and conveys the idea of the sentiment showing itself in action by those sweet signs and marks of devotion which are so highly prized by the loving heart. The origin of this word indicates its sentient and spontaneous character. Its radical is the interjection *huay*, which among that people is an inarticulate cry of tenderness and affection. *

The verb *lluylluy* means literally to be tender or soft, as fruit, or the young of animals; and applied to the sentiments, to love with tenderness, to have as a darling, to caress lovingly. It has less of sexuality in it than the word last mentioned, and is applied by girls to each other, and as a term of family fondness. It is on a parallel with the English "dear," "to hold dear," etc.†

In the later compositions in Qquichua the favorite word for love is *ccuyay*. Originally this expression meant to pity, and in this sense it occurs in the drama of Ollanta; but also even there as a term signifying the passion of love apart from any idea of compassion.‡ In the later songs, those whose composition may be placed in this century, it is preferred to *munay* as the most appropriate term for the love between the sexes. § From it also is derived the word for charity and benevolence.

As *munay* is considered to refer to natural affection felt within the mind, *mayhuay* is that ostentatious sentiment which displays itself in words of tenderness and acts of endearment, but leaves it an open question whether these are anything more than simulated signs of emotion. ‖

This list is not exhaustive of the tender words in the Qquichua; but it will serve to show that the tongue was rich in them, and that the ancient Peruvians recognized many degrees and forms of this moving sentiment.

*From the *Ollanta:*
*Huay ccoyallay. Huay mamallay,*
*Ay, huayllucusccay ccosallay.*
Oh, my queen! Oh, my mother!
Oh, my husband so beloved! (305, 306).
These lines show both the word and its derivation.

†From the *Ollanta:*
*ña llulluspa*, caress thee, are fond of thee (934).

‡From the *Ollanta:*
*ccuyaccuscallay*, my beloved one (1758).
*ccuyaska*, compassionate (1765).

§See the Qquichua love songs, *haraui* and *huaynu*, as they are called, given by Anchorena in his *Gramática Quechua*, pp. 131–135.

‖See Holguin, *Vocabulario Qquichua*, s. v., *mayhuay* and *mayhuaycuni*.

What is also noteworthy is the presence in this language of the most philosophical term for friendship in its widest sense that can be quoted from any American language. It is *runaccuyay*, compounded of *ccuyani*, mentioned above, and *runa*, man — the love of mankind. This compound, however, does not occur in the Ollanta drama, and it may have been manufactured by the missionaries. The usual term is *maciy*, which means merely "associate," or *kochomaciy*, a table-companion or *convive*.

### *V. The Tupi-Guarani.*

The linguistic stock which has the widest extension in South America is that which is represented in Southern Brazil by the Guarani, and in Central and Northern by the Tupi or Lingoa Geral. The latter is spoken along the Amazon and its tributaries for a distance of twenty-five hundred miles. It is by no means identical with the Guarani, but the near relationship of the two is unmistakable. The Guarani presents the simplest and more primitive forms, and may be held to present the more archaic type.

The word for love in the Guarani is *aihu*, in another form *haihu*, the initial *h* being dropped in composition. This expression is employed for all the varieties of the sentiment, between men, between the sexes, and for that which is regarded as divine.* For "a friend," they have no other term than one which means a visitor or guest; and from this their expression for "friendship" is derived which really means "hospitality."†

Verbal combinations in Guarani are usually simple, and I do not think we can be far wrong in looking upon *aihu* as a union of the two primary words *ai* and *hu*. The former, *ai*, means self or the same; and the latter, *hu*, is the verb to find, or, to be present.‡ "To love," in Guarani, therefore, would mean, "to find oneself in another," or, less metaphysically, "to discover in

*Thus:

*Tupa nande raihu*, God loves us.

*Tupa nande haihu*, the love which we have for God.

*ahaihu*, I love her, (him, it).

†*yecotiaha*, friend; compounded of *coti*, a dwelling, and *aha*, to go,—a goer to a dwelling, a visitor. This, and the other Guarani words given, are taken from Ruiz de Montoya's *Tesoro de la Lengua Guarani* (ed. Vienna, 1876).

‡Another possible derivation would be from *ahii*, desire, appetite (Spanish, *gana*); and *hu*, in the sense of being present. This would express a longing, a lust, like love (see above).

another a likeness to oneself." This again is precisely the primary signification of the Latin *amare;* and if the sentiment impressed in that way the barbarous ancient Aryans, there is no reason why it would not have struck the Guaranis in the same manner.

In the Tupi or Lingua Geral the word for love is evidently but a dialectic variation of that in the Guarani. It is given by some authors as *çaiçu*, plainly a form of *haihu;* and by others as *çauçu.** These forms cannot be analyzed in the Tupi itself, which illustrates its more modern type.

There are other dialects of this wide-spread stem, but it would not be worth while to follow this expression further in its diverse forms. It is interesting, however, to note that which appears in the Arawack, spoken in Guiana. In that tongue to love is *kanisin*, in which the radical is *ani* or *ansi.* Now we find that *ani* means "of a kind," peculiar to, belonging to, etc. Once more it is the notion of similarity, of "birds of a feather," which underlies the expression for the conception of love. †

*Conclusions.*

If, now, we review the ground we have gone over, and classify the conceptions of love as revealed in the languages under discussion, we find that their original modes of expression were as follows:

1. Inarticulate cries of emotion (Cree, Maya, Qquichua).
2. Assertions of sameness or similarity (Cree, Nahuatl, Tupi, Arawack).
3. Assertions of conjunction or union (Cree, Nahuatl, Maya).
4. Assertions of a wish, desire or longing (Cree, Cakchiquel, Qquichua, Tupi).

These categories are not exhaustive of the words which I have brought forward, but they include most of them, and probably

* I find *çaiçu* given by Dr. Couto de Magelhaes in his *Curso da Lingua Geral segundo Ollendorf* (Rio de Janeiro, 1876); *saisu* by Dr. Amaro Cavalcanti in *The Brazilian Language and its Agglutination* (Rio Janeiro, 1883); *çauçub* by Dias, *Diccionario da Lingua Tupy* (Leipzig, 1858) and by Dr. E. F. França in his *Chrestomathia da Lingua Brazilica* (Leipzig, 1859).

† "*Ani*, es gehört, ist eigen; *ta ani*, nach seiner Art." *Arawackisch-Deu'ches Wörterbuch.* This dictionary, published anonymously at Paris, in 1882, in Tome viii, of the *Bibliotheque Linguistique Américaine*, is the production of the Moravian Missionary, Rev. T. S. Schuhmann. See *The Literary Works of the Foreign Missionaries of the Moravian Church.* By the Rev. G. H. Reichelt. Translated and annotated by Bishop Edmund de Schweinitz, p. 13 (Bethlehem, 1886).

were this investigation extended to embrace numerous other tongues, we should find that in them all the principal expressions for the sentiment of love are drawn from one or other of these fundamental notions. A most instructive fact is that these same notions are those which underlie the majority of the words for love in the great Aryan family of languages. They thus reveal the parallel paths which the human mind everywhere pursued in giving articulate expression to the passions and emotions of the soul. In this sense there is a oneness in all languages, which speaks conclusively for the oneness in the sentient and intellectual attributes of the species.

We may also investigate these categories, thus shown to be practically universal, from another point of view. We may inquire which of them comes the nearest to the correct expression of love in its highest philosophic meaning. Was this meaning apprehended, however dimly, by man in the very infancy of his speech-inventing faculty?

In another work, published some years ago, I have attempted a philosophic analysis of the sentiment of love. Quoting from some of the subtlest dissectors of human motive, I have shown that they pronounce love to be "the volition of the end," or "the resting in an object as an end." These rather obscure scholastic formulas I have attempted to explain by the definition: "Love is the mental impression of rational action whose end is in itself."* As every end or purpose of action implies the will or wish to obtain that end, those expressions for love are most truly philosophic which express the will, the desire, the yearning after the object. The fourth, therefore, of the above categories is that which presents the highest forms of expression of this conception. That it also expresses lower forms is true, but this merely illustrates the evolution of the human mind as expressed in language. Love is ever the wish; but while in lower races and coarser natures this wish is for an object which in turn is but a means to an end, for example, sensual gratification, in the higher, this object is the end itself, beyond which the soul does not seek to go, in which it rests, and with which both reason and emotion find the satisfaction of boundless activity without incurring the danger of satiety.

* *The Religious Sentiment, its Source and Aim; a Contribution to the Science and Philosophy of Religion*, p. 60, (New York, 1876).

## *Notices of New Fresh-Water Infusoria.* By Alfred C. Stokes, M.D.

(*Read before the American Philosophical Society, November 5, 1886.*)

### *Mastigamœba longiflum*, sp. nov. (Figs. 1, 2, 3, 4).

Animalcules repent, very soft and extremely changeable in shape, emitting from all parts of the surface simple lobate pseudopodia, or wave-like expansions of the sarcode; the single antero-terminal flagellum five times as long as the contracted body, about twice as long as the extended zoöid; contractile vesicle single, anteriorly placed; nucleus subspherical, small, situated near the anterior extremity. Length, when contracted, $\frac{1}{1250}$ inch; extended, $\frac{1}{500}$ inch. Habitat—Standing water, among decaying vegetation.

The figures (1, 2, 3, 4) show four forms of the same interesting little amœboid creature. The movements are usually slowly repent, while the flagellum is quite active. The zoöid not rarely glides forward without the protrusion of distinct pseudopodia, only changing the form of the body by irregular expansions and contractions, while on other occasions the unbranched obtuse pseudopodia extend from any or all points of the periphery.

### *Anisonema pusilla*, sp. nov. (Fig. 5).

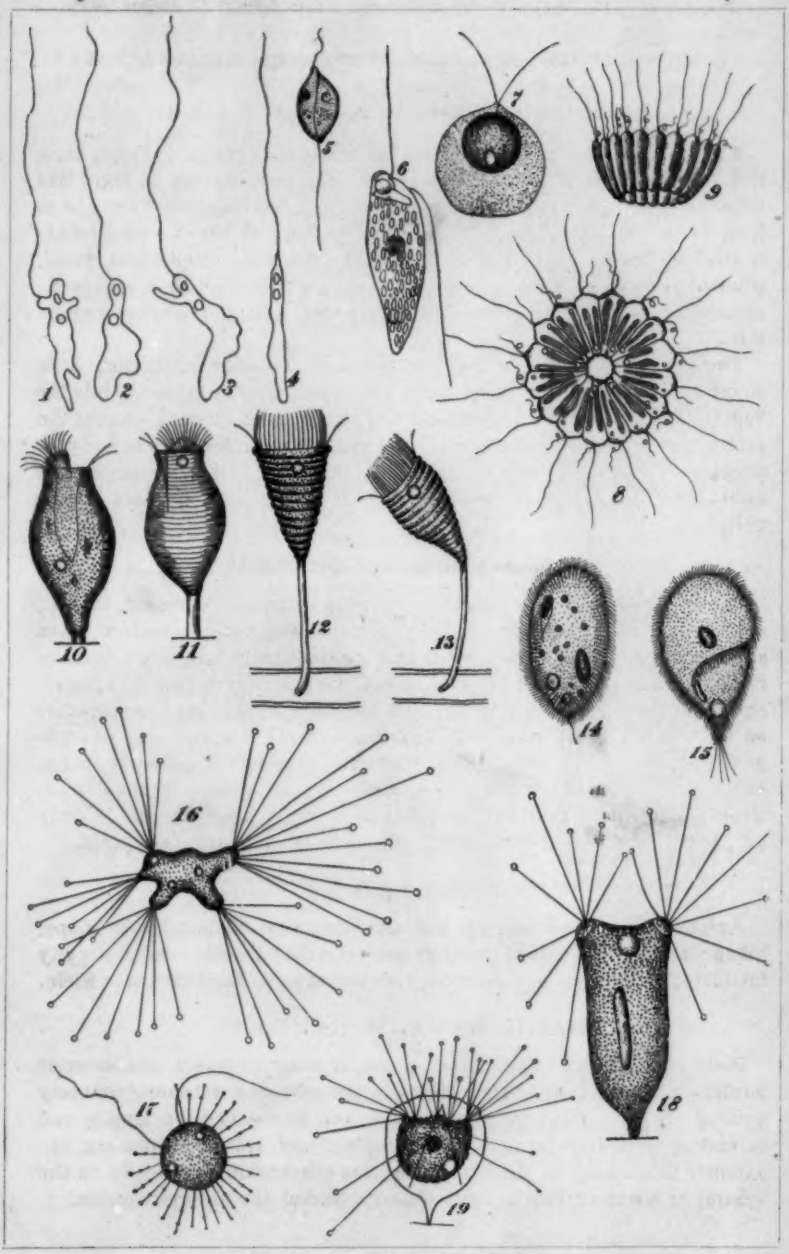
Body subelliptical, less than twice as long as broad, depressed, the two extremities narrowed and obtusely pointed, the ventral surface often slightly concave, the dorsal convex and longitudinally furrowed; anterior flagellum subequal to the body in length, the posterior or trailing appendage about three times as long as the zoöid, both originating near together on the ventral aspect a short distance back of the frontal apex; pharyngeal passage minute, but distinct; contractile vesicle apparently single, subcentrally located; nucleus not observed; endoplasm frequently enclosing small dark particles, probably food fragments. Length of body $\frac{1}{1250}$ inch. Habitat—Pond-water. Movements oscillating, not rapid.

### *Trentonia*, gen. nov.

Animalcules free-swimming, soft and somewhat changeable in shape, biflagellate, one flagellum trailing, one vibratile; frontal border slightly bilabiate; trichocysts not observed; otherwise as in *Raphidomonas* Stein.

### *Trentonia flagellata*, sp. nov. (Fig. 6).

Body obovate, less than three times as long as broad, the anterior border oblique and somewhat bilabiate, the posterior extremity obtusely pointed; flagella subequal to each other and to the body in length, one extending arcuately forward, often rapidly and spirally vibrating, apparently originating in the oral fossa; the other taking its origin on the ventral or lower surface a short distance behind the anterior extremity,




*Fresh-water Infusoria.* Stokes.

usually trailing; oral aperture conspicuous, communicating with a capacious subtriangular pharyngeal cavity; contractile vesicle single, spherical, near the anterior extremity; nucleus subspherical, situated near the body centre; endoplasm enclosing numerous small ovate chlorophyl corpuscles forming a bright-green layer near the cuticular surface. Length of body $\frac{1}{210}$ inch. Movements rotary on the longitudinal axis, but not rapid. Reproduction by encystment and subsequent binary fission. Habitat—Pond-water.

This is very similar to *Raphidomonas semen* (Ehr.) Stein, with two flagella and no apparent trichocysts. When first observed, more than a year ago, it was without hesitation identified with the above-mentioned European form; but some evenings later, while again examining the Infusorians, it became evident that the specimens possessed two flagella, while the Raphidomonas has but one; otherwise they were identical with the form just named, with the exception of the trichocysts. Recently the same Infusoria have been collected in a locality remote from the first, and the previous observations confirmed.

The trailing flagellum is ordinarily extremely difficult to see. When the Infusorium is rendered uncomfortable and sluggish by prolonged confinement beneath the cover-glass, or partially poisoned by iodine, then the vibratile flagellum, which is usually held stiffly in advance, the tip alone trembling, is flashed into sight as a rapidly undulating spiral, and the trailing appendage is also momentarily directed forward. At other times it also becomes visible when the Infusorian is in certain positions or has assumed certain changes of form. How the careful European investigators could have overlooked this trailing appendage is inexplicable, providing, of course, that the present form is *Raphidomonas semen*, with which two flagella are now for the first time observed. It is scarcely possible to believe that Stein would have failed to notice so important an appendage. Yet these two forms are so nearly identical, with the exception of the biflagellate character of the present Infusorian, that I confer the generic title *Trentonia* provisionally only. If, after re-examination, the European Raphidomonas should prove to be monoflagellate, then will *Trentonia flagellata* become the type of a new family group necessarily taking the name Trentonidæ.

*Cryptoglena truncata*, sp. nov. (Fig. 7).

Lorica subspherical, depressed posteriorly, the anterior border rounded, the oral aperture slightly eccentric and somewhat conically projecting; the posterior margin truncate, often slightly retuse; the lower or ventral aspect gently concave, the dorsal convex; enclosed zoöid subspherical; endoplasm green; contractile vesicle double, anteriorly situated; amylaceous corpuscle single, subspherical and subcentrally located; lorica minutely punctate, colorless when young. Length $\frac{1}{1257}$ inch or less. Habitat—Pond-water. Movements rotary on the long axis.

The enclosed body varies much in size. It is usually small, occupying

but a very limited portion of the lorica cavity anteriorly, to which it is apparently in no way attached. Among the numerous individuals examined, none have been seen with the zoöid completely filling the cavity of the sheath, and but one in which the body even approached the posterior and lateral walls.

*Cyclonexis*, gen. nov. (κυκλος; νηζις).

Animalcules laterally joined to form free swimming annular colonies, the zoöids illoricate; flagella two, one long, the other short, both vibratile; endoplasm enclosing two laterally disposed color-bands; eye-like pigment specks absent. Habitat—Fresh water.

This differs from *Uvella*, which it most closely resembles, in the lateral instead of a posterior union of the constituent animalcules, in the annular rather than a spheroidal form of the colony, and in the very diverse length of the two flagella.

*Cyclonexis annularis*, sp. nov. (Figs. 8, 9).

Colony composed of from ten to twenty zoöids, the posterior extremities of the constituent animalcules in young and small clusters occasionally in contact, in older and larger colonies remote, leaving a central more or less circular space; bodies obovate, compressed, about twice as long as broad, obtusely pointed anteriorly, rounded and narrowed posteriorly; long flagellum equaling or exceeding the body in length, the short appendage about one-half as long, usually convoluted spirally; contractile vesicle double, small, spherical, located in the anterior body-half, near one lateral border; color-bands yellowish. Length of body $\frac{1}{1500}$ to $\frac{1}{2250}$ inch; diameter of the annular colony $\frac{1}{150}$ inch or less. Movements rotatory. Habitat—Marsh-water, with *Sphagnum*.

*Pyxidium urceolatum*, sp. nov. (Fig. 10).

Body vasiform, less than twice as long as broad, widest centrally, constricted anteriorly, the posterior extremity narrowed to form a short colorless prolongation somewhat broader than the pedicel; cuticular surface smooth; peristome border truncate; ciliary disk but slightly exserted, ciliary circles two, long and fine; vestibulum large, extending to near the centre of the body; contractile vesicle in close proximity to the posterior part of the vestibule and apparently emptying into it; pedicel extremely short; the contracted zoöid ovate, posteriorly invaginate. Length of body $\frac{1}{375}$ inch. Habitat—Pond-water; on rootlets of *Lemna*.

*Rhabdostyla invaginata*, sp. nov. (Fig. 11).

Body vasiform, often slightly gibbous, about one and one-half times as long as broad, widest centrally, tapering posteriorly to the pedicel, and anteriorly to the slight constriction beneath the peristome; surface transversely striate; peristome border not revolute; ciliary disk prominent, conical, ciliary circles two; pedicel short, about two-fifths as long

as the body. Length of body $\frac{1}{750}$ inch. Habitat—Pond-water; attached to *Cypris*.

The contracted body is ovate, and the pedicel is then invaginate within the posterior extremity, this margin of the zoöid coming into actual contact with surface of the object supporting the pedicel.

The characteristic conical form of the ciliary disk, either alone or in connection with the invagination of the pedicel by the contracted body, renders the species readily distinguishable from all other members of the genus.

*Opisthostyla*, gen. nov. (*Οπισθε*; *στυλος*).

Animalcules resembling those of *Rhabdostyla*, but the rigid pedicel curved near its point of attachment to the submerged object, this part acting, when the zoöid is contracted, like a spring, and throwing the animalcule and the otherwise inflexible foot-stalk backward through the water, the whole immediately becoming upright by the recoil of the curved extremity of the pedicel. Inhabiting fresh water.

*Opisthostyla annulata*, sp. nov. (Figs. 12, 13).

Body conical-campanulate, slightly changeable in form, somewhat gibbous or the lateral margins nearly straight, the zoöid obliquely or vertically placed on the pedicel, less than twice as long as broad, strongly striate or annulate transversely; obovate when contracted; peristome border revolute, ciliary circles two; pedicel as long as the body, the distal extremity suddenly and shortly curved. Body and pedicel each $\frac{1}{1125}$ inch long. Habitat—Pond-water; attached to Algæ.

The short curve at the end of the pedicel at its point of attachment to the supporting object seems to act as a spring, as already stated, to assist the zoöid in throwing itself backward when the body contracts, the entire Infusorian then describing rather more than a semicircle in the water, having the point of attachment of the foot-stalk as the centre. The movement is usually very quickly accomplished, the return of the animalcule to its normally erect position being almost as suddenly achieved.

In the "Annals and Magazine of Natural History" for February, 1886, the writer described an Infusorian under the name *Rhabdostyla pusilla*, which is certainly a member of the new generic group here formulated. The following is an amended diagnosis of the form referred to:

*Opisthostyla pusilla* Stokes (*Rhabdostyla pusilla* Stokes *).

Body campanulate, tapering posteriorly, less than twice as long as broad, the surface transversely striate; peristome slightly exceeding the body-centre in width, the border revolute; contracted zoöid ovate; pedicel scarcely longer than the body, the distal extremity shortly and suddenly curved. Length of body $\frac{1}{1125}$ inch. Habitat—Pond-water; attached to *Ceratophyllum*.

* Annals and Magazine of Natural History, S. 5, Vol. xvii, p. 106, Pl. I, Fig. 17.

This differs from the preceding species of Opisthostyla in the more conical form and less strongly marked transverse furrows of the body, and in the greater proportionate length of the pedicel.

*Colpoda depressa*, sp. nov. (Fig. 14).

Body ovate, depressed, less than three times as long as broad, slightly widest anteriorly, the frontal border rounded, the right-hand side of the posterior margin slightly and obliquely truncate, the right-hand body-margin somewhat flattened, the left hand side convex; ventral surface flattened, slightly concave; cilia of the posterior border longest and most conspicuous, a single cilium occasionally longer than the others; oral aperture ventral, in the anterior body-half, on the right-hand side of the median line; the projecting ciliary tuft broad, the cilia fine and appearing like an undulating membrane; contractile vesicle single, spherical, in the posterior body-half on the right-hand side of the median line; the cuticular surface roughened by minute elevations arranged in longitudinal rows, except in the oral region, where a long obovate space is comparatively smooth; endoplasm colorless, granular; trichocysts numerous, arranged perpendicularly to the cuticular surface; nucleus ovate, subcentrally located; anal aperture ventral, on the right-hand side of the posterior extremity. Length of body $\frac{1}{300}$ to $\frac{1}{250}$ inch. Habitat—Standing water, with *Sphagnum*. Reproduction by transverse fission.

The most recently formulated generic diagnosis of *Colpoda* refers to the oral aperture as situated in a cleft like fissure, that orifice in the present form not being so placed but on the flattened ventral surface. It would therefore seem preferable to slightly modify the generic description so as to include the present Infusorian, rather than to form a new generic title upon a difference so slight, especially since the other essential characters are undoubtedly similar. In the previously known species trichocysts have not been observed, neither has the position of the anal aperture been recorded.

The form here referred to bears some affinity to *Anophrys*, but to admit it within that group a change would also be needed in the generic description.

*Metopides acuminata*, sp. nov. (Fig. 15).

Body obovate, about twice as long as broad, compressed, the frontal border rounded, the posterior extremity tapering from the body-centre and terminating in a conspicuous acuminate prolongation; the anterior body-half apparently folded obliquely across the ventral surface, the peristomal margin strongly ciliate and prolonged beyond the centre of the body to near the right-hand border; a tuft of long, fine setæ projecting from the posterior acumination; nucleus broadly ovate or subspherical, placed near the body-centre; contractile vesicle single, near the posterior

extremity. Length of body, $\frac{1}{115}$ inch. Habitat—Standing pond-water, with decaying vegetation. Movements rotary on the longitudinal axis.

*Trichophrya sinuosa*, sp. nov. (Fig. 16).

Body flattened, irregular in shape, the margins undulate and lobulate; tentacles fascicled, long, distinctly capitate, protruded from the marginal lobes, the clusters seldom exceeding five in number; contractile vesicles multiple, marginal; nucleus not observed. Length $\frac{1}{160}$ inch. Habitat—Pond-water; attached by the entire lower surface to *Anacharis*. Movements slow.

This differs from *T. epistylidis* C. and L., in its much smaller size, and especially in the marginal arrangement of the tentacles. The latter are long, often three times the length of the body.

*Acinetactis*, gen. nov. (*Acineta*; *ακτις*).

Animalcules subspherical, soft and changeable in form, free-swimming or temporarily adherent, emitting from all parts of the surface capitate, ray-like pseudopodia; flagella two, vibratile, one temporarily adherent by its distal extremity. Inhabiting fresh water.

The single member of this previously undescribed genus differs from the *Actinomonas* of Saville Kent in the presence of two flagella and in the distinctly capitate character of the filamentous pseudopodia, the latter often being conspicuously pin-like in appearance. The existence of the temporarily adherent flagellum, in addition to the habitually vibratile appendage, necessitates not only the formation of a new generic title, but a new family group, for the reception of this singular creature, the name of the latter necessarily being *Acinetactidæ*.

*Acinetactis mirabilis*, sp. nov. (Fig. 17).

Body subspherical, soft and plastic, often emitting short lobate pseudopodia in addition to the fine, capitate rays projecting from all parts of the periphery, the last-named appendages usually bearing one or more minute supplementary protoplasmic globules in the course of the ray, in addition to the globule tipping the free extremity; rays occasionally exceeding the diameter of the body in length; flagella subequal, their length about twice the diameter of the zoöid, originating from the anterior border, but at some distance from each other; contractile vesicle double, situated on opposite sides of the anterior body-half; nucleus apparently subcentrally located and subspherical; endoplasm granular, especially posteriorly. Diameter of the body $\frac{1}{2250}$ inch. Habitat—Stagnant pond-water, among decaying vegetation. Movements rapid.

When in the free-swimming phase, the ray-like pseudopodia are usually confined to the posterior region of the body, or they may be entirely withdrawn, thus leaving the animalcule almost entirely smooth.

*Acineta lacustris*, sp. nov. (Fig. 18).

Lorica elongate-obovate or subvasiform, strongly compressed, less than three times as long as broad, widest anteriorly, the sides continuous across the frontal border, leaving a rounded lateral aperture at each angle for the exit of the tentacles; slightly constricted beneath the anterior border, and very moderately inflated near the posterior extremity, the frontal margin concave; pedicel very short and hollow; enclosed zoöid often entirely filling the entire cavity of the lorica; tentacles in two antero-lateral fascicles, distinctly capitate; contractile vesicle single, placed near the anterior border; nucleus elongate, vertical; endoplasm granular. Length of the lorica $\frac{1}{215}$ to $\frac{1}{170}$ inch. Habitat—Pond-water; attached to *Anacharis*.

*Acineta stagnatilis*, sp. nov. (Fig. 19).

Lorica subcircular in outline, rounded and inflated posteriorly, compressed anteriorly, the frontal border irregularly convex; pedicel short, hollow, from one-fourth to one-fifth as long as the lorica, widest at its junction with the sheath, tapering thence and terminating in a button-like point of attachment; frontal margin pierced by a slit-like fissure, and two anteriorly converging, narrow fissures on the front and rear walls, for the exit of the tentacles; the enclosed animalcule occupying the centre of the lorica, apparently not attached to the walls, subspheroidal, the anterior border truncate; tentacles more or less fascicled, capitate; contractile vesicle single, postero-lateral; endoplasm granular. Length of the lorica, including pedicel, $\frac{1}{150}$ inch. Habitat—Pond-water; on *Myriophyllum*.

## EXPLANATION OF THE FIGURES.

Figs. 1–4. Mastigamœba longifilum; different forms of one individual.
Fig. 5. Anisonema pusilla, × 900.
Fig. 6. Trentonia flagellata, × 430; gen. et sp. nov.
Fig. 7. Cryptoglena truncata, × 772.
Figs. 8, 9. Cyclonexis annularis, × 630; front and side views; gen. et sp. nov.
Fig. 10. Pyxidium urceolatum, × 290.
Fig. 11. Rhabdostyla invaginata, × 750.
Figs. 12, 13. Opisthostyla annulata, × 730; gen. et sp. nov.
Fig. 14. Colpoda depressa, × 300.
Fig. 15. Metopides acuminata, × 375.
Fig. 16. Trichophrya sinuosa, × 255.
Fig. 17. Acinetactis mirabilis, × 900; gen. et sp. nov.
Fig. 18. Acineta lacustris, × 415.
Fig. 19. Acineta stagnatilis, × 135.

*Stated Meeting, November 5, 1886.*

Present, 16 members.

President, Mr. FRALEY, in the chair.

Mr. Samuel W. Pennypacker, a lately elected member, was presented to the Chair and took his seat.

Donations were announced from the following: Geological Survey of India, Calcutta; Geographische Gesellschaft, Wien; K. P. Adademie der Wissenschaften and Deutsche Geologische Gesellschaft, Berlin; Naturwissenschaftliche Gesellschaft "Isis," Dresden; Senckenbergische Naturforschende Gesellschaft, Frankfurt A/M.; Physikalische Okonomische Gesellshaft, Königsberg; Deutsche Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, München; Nassauische Verein für Naturkunde, Wiesbaden; Société Helvétique des Sciences Naturelles, Neufchatel; Archives Néerlandais, Harlem; Musée Royale d'Histoire Naturelle de Belgique, Bruxelles; Biblioteca Nazionale V. E., Firenze; R. Accademia dei Lincei and Biblioteca Nazionale Vittorio Emanuele, Rome; Société de Geographie and Revue Internationale de L'Enseignement, Paris; R. Academia de Ciencias and R. Academia de la Historia, Madrid; Royal Geographical and Zoölogical Societies, and the Society of Antiquaries, London; University Library, Cambridge; Radcliffe Observatory, Oxford; Royal Observatory, Edinburgh; Royal Society of Canada, Montreal; Geological Survey of Canada, Ottawa; Massachusetts Historical Society, Boston; Essex Institute, Salem; Dr. Samuel A. Green, Groton; Newport Historical Society; "American Journal of Science," New Haven; "Traveler's Record," Hartford; Meteorological Observatory, New York; New York State Library, Albany; Oneida Historical Society, Utica, N. Y.; Daniel Draper, New York, N. Y.; Franklin Institute, Historical Society of Pennsylvania, Spelling Reform Association, Messrs. Philip C. Garrett, Philip H. Law, Henry Phillips, Jr., and McCalla & Stavely, Philadelphia; Dr. Hugh Hamilton, Harrisburg; Johns Hopkins University and "American Journal of Archæology,"

Baltimore; U. S. National Museum, Washington; Leander McCormick University, University of Virginia; Mr. William Harden, Savannah; Prof. Henry S. Frieze, Ann Arbor; State Historical Society, Iowa; Mr. Adair Welcker, Sacramento.

Letters of envoy were read as follows: The K. Preussische Akademie der Wissenschaften; the Canadian Geological and Natural History Survey.

Letters of acknowledgment were received from K. K. Sternwarte. Prag (122); Iapetus Steenstrup, Copenhagen (122); State Library of Massachusetts, Boston (96–123); Oneida Historical Society, Utica, New York (123).

A letter was read from the Deutsche Morgenländische Gesellschaft (in answer to one addressed to it by the Secretaries to know why it had never sent its publications to this Society, although it had received for some years), stating that it had considered the proceedings to have been the gift of the Smithsonian Institution, and that it did not desire to exchange with this Society.

On motion, its name was ordered to be removed from the list of exchanges.

The "Revue Litteraire et Scientifique" replied to a similar query, and stated that the Redaction had ordered the exchange to be discontinued.

On motion, the exchange was ordered to be discontinued.

The death of John S. Haines, Philadelphia, was announced as having taken place on November 4, 1886, in the sixty-seventh year of his age.

The President announced the appointment of Mr. Richard Vaux to prepare the obituary of Judge Ludlow, and Prof. John M. Maisch that of Dillwyn Parrish.

Prof. Cope presented for the Transactions a paper on "Lemurine Reversion in Human Dentition."

The paper was referred to a Committee, consisting of Drs. Brinton, Oliver and Jayne.

Dr. D. G. Brinton read a paper on "The Conception of Love in some American Languages."

The Secretaries presented a paper on "The Facial Nerve of

the Domestic Cat," by Prof. T. B. Stowell, of Cortlandt, N.Y.; also one from Dr. A.C. Stokes, of Trenton, N.J., on "Notices of New Fresh-water Infusoria."

Pending nomination No. 1113 and new nominations Nos. 1114–1150 were read.

The President reported that he had received and paid over to the Treasurer the interest on the Michaux *rentes* due October 1, 1886, amounting to $131.80.

And the Society was adjourned by the President.

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*Stated Meeting, November 19, 1886.*

Present, 14 members.

President, Mr. FRALEY, in the Chair.

Acknowledgments were read from the K. Leopold-Carol. Akademie, Halle, a. S. (118, 122); Société Royale des Sciences, Upsal (117–122); New York State Library, Albany (121–123).

Letters of envoy were read from the Société Royale des Sciences, Upsal; Naturwissenschaft. Gesellschaft, Marburg; Meteorological Office and the Statistical Society, London; Col. Charles C. Jones, Jr., Augusta, Ga.

Additions to the Library were reported from Department of Mines, New South Wales; Societas pro Fauna et Flora Fennica, Helsingfors; Observatory at Tashkend, in Turkistan, Russia; K. P. Akademie der Wissenschaften, Gesellschaft für Anthropologie, Ethnologie und Urgeschichte, R. Friedländer und Sohn, Berlin; Naturhistorischer Verein, Bonn; K. Leopoldino-Carolina Akademie der Deutschen Naturforscher, Halle, a. S.; "Astronomische Nachrichten," Kiel; Naturforschende Gesellschaft, Leipsic; Gesellschaft zur Beförderung der Gesammten Naturwissenschaften, Marburg; Editor of "Naturforscher," Tübingen; Société Royale des Sciences, Upsal; "Flora Batava," Leiden; Acadèmie Royale, Musée Royale D'Histoire Naturelle de Belgique, Bruxelles; R. Accademia dei Lincei, Rome; Biblioteca Nazionale Centrale di Firenze;

Royal Geographical and Astronomical Societies, Statistical Society, British Association for the Advancement of Science, Meteorological Office, "Nature," Mr. John Hampden, London; Natural History Society, Montreal; Institut Canadien-Français, Ottawa; Canadian Institute, Toronto; Prof. Thomas Sterry Hunt, Hon. Robert C. Winthrop, Boston; Museum of Comparative Zoölogy, Harvard University, Prof. Samuel H. Scudder, Cambridge; American Chemical Society, "The Critic," New York; Brooklyn Entomological Society; Academy of Natural Sciences, College of Pharmacy, Messrs. Henry C. Lea and Henry Phillips, Jr., Philadelphia; Johns Hopkins University, Prof. Ira Remsen, Baltimore; United States Civil Service Commission, Smithsonian Institution, Hydrographic Office, Washington; Col. Charles C. Jones, Jr., Augusta, Ga.; Cincinnati Society of Natural History; Rev. Stephen D. Peet, Chicago; Professors C. F. de Lendero and Raúl Prieto, Mexico.

Dr. J. T. Rothrock read by appointment an obituary notice of the late Hon. Eli K. Price, LL.D., Vice-President of the Society.

And, on motion, the Society was adjourned.

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## *Biographical Memoir of the late Honorable Eli K. Price, LL.D., by J. T. Rothrock, Professor of Botany in the University of Pennsylvania.*

(*Read before the American Philosophical Society, Nov. 19, 1886.*)

On the twentieth day of July, 1797, Eli Kirk Price was born in East Bradford township, County of Chester, and State of Pennsylvania. There was nothing in his surroundings, or in his opportunities, which indicated for him a life of more than the average success or usefulness. It is true that his home lay in the centre of what, for our young country, is classic soil. He must in later years have heard from those, who witnessed the battle of Brandywine, the tales and trials of that day which was

so unfortunate to our arms. The field itself had doubtless often been trodden over by him. The very house in which on the first day of each week he was afterwards accustomed to worship still showed on its floors what were said to be the stains of blood from our wounded soldiers who were brought in for medical treatment. Whether this was so or not, there is no doubt that the building was used as a temporary hospital. The whole atmosphere of the region was then, and still is, full of the inspiration of patriotism. Up and down the valley, far as the eye could reach, lay a landscape of singular beauty. The very hills had an individual character, and there was no turn in the roads which wound between them, but brought some new surprise of beauty. To the south and west were "*The hills beyond the Brandywine*," which, once seen in the soft haze of Indian summer, could never be forgotten. What wonder then that an English officer, as he overlooked the region, said: "I am not astonished that these people fight for such a country." The temper of this fiery lad must often have been sorely tried when he learned how his "peace-loving" parents and neighbors had suffered from the depredations of the enemy. Perhaps the discipline of self-control, early enforced by his watchful parents, was one of the secrets of his future success. He never wearied in devotion to the memory of those under whose critical eyes he grew to manhood.

So far as these externals could go, it is true, they were all in his favor, but, as other boys who never came to fill his place in public esteem shared them with him, we must conclude there was in the lad himself a good measure of that holy ambition which goes so far in moulding higher individual destiny.

"Philip, father of Eli, was the fifth in lineal descent from that Philip Price who came into Pennsylvania with the Welsh settlers, and took up Merion, Haverford and Radnor townships in 1682. The name of Price was handed down through four generations from the first settler by a single male representative in each generation."

Rachel, his mother, was a daughter of William Kirk, of East Nantmeal, Chester county, the tenth child of Alphonsus Kirk, who came from the north of Ireland, landed first at Jamestown, Virginia, January 12th, 1689, and shortly after settled in Centre, New Castle county, Delaware.

William Kirk's second wife was Sibilla Davis (of Welsh descent), the mother of Rachel, and hence Eli Kirk Price's grandmother. Philip and Rachel were married October 20th, 1784. For generations Eli's ancestors had all been members of the religious society of Friends.

Though to all "Friends" human strife is a matter of the utmost concern and sadness, one must not infer that they were lacking in courage or in enterprise. On the contrary they have been among the very best of pioneers; often, indeed, they were the first, when principle or human life was at stake, to brave any danger, or to meet any hardship. Under a quiet exterior were often concealed memories of thrilling adventures with outward foes, as well as of desperate struggles with the powers of inborn sin tempting them away from the sober teachings of conscience and honest judgment. The life of no real Friend is uneventful. It may not strike the ear or eye of the world, but it is full of striving after perfect purity in thought, word and deed. It may lack the glamour of popular applause, but it is rich in the solid worth of conscious rectitude.

From a long line of such ancestors came the subject of this sketch. Integrity through all these generations had matured into an instinct in him It might be said that he despised and hated fraud simply because it was in him to do so, without conscious effort on his part.

Philip Price was among the leading farmers of his day. It was he who introduced the Washington Thorn into Chester county, where for half a century it has been not only a useful hedge, but one of the most characteristic features of the landscape. He was also among the earliest advocates of the use of

mineral fertilizers in agriculture. Judge Peters wrote: "I have heard of none who have been more remarkably successful in the plaster system than Mr. West and Mr. Price." Philip Price was the first President of the Chester County Agricultural Society. He was furthermore one of the earliest to apply the vaccine crust in this community. With a firm faith in its efficacy, he vaccinated all his children at a time when there were more who doubted than believed in its power. Here he stood out, not only as a moral hero, but as a public benefactor. Moreover, it must be remembered, that in that early day there existed, if not open opposition to vaccination, at least a very strong popular prejudice against it.

Neither of the parents of the young Eli was wealthy. Their family was large; eleven in all, of whom he was the eighth. They were industrious and frugal, though unable to give their children what we should call a liberal education. But they did what was perhaps almost as well in encouraging such a thirst for useful knowledge that no ordinary obstacles could quench it. It is true that Eli entered Westtown school in 1812 (as number 772 of the first thousand pupils), but the course there was mainly what we should regard as the necessary, solid branches. Of one thing, however, we may be sure—what was taught was well taught. There was no more sham then than now in that most admirable school.

It may be worth the while to recall how much of our local history and of our advance in the civilized arts Mr. Price was a witness of.

West Chester was not made into a borough until two years after his birth. In the year 1800 the population was but 374. This was more than thirty years before the late Dr. William Darlington said he had hopes of the town because it had become so large that the inhabitants could live off each other. Mr. Price was thirty-five years old before the first railroad entered the town, and this was about three years before there was an

Episcopal church there. The Presbyterian church was perhaps a year earlier, but those vigilant workers, the Methodists, had reached the town about twenty-four years before the Episcopalians or Presbyterians were organized. So much for the now flourishing town of more than seven thousand inhabitants which stands almost within sight of his birthplace.

Even this great city in 1797 contained less than forty thousand inhabitants. All the region beyond Carlisle was the Great West, then, on the whole, perhaps less fully known than any spot of our national domain south of Alaska is to-day. As late as 1802 the inhabitants of the region west of the Alleghany mountains found it easier to send their flour from Pittsburgh to the Antilles by water than to send it to Philadelphia or Baltimore by land. Pittsburgh contained only four hundred houses. Neither anthracite coal nor gas, nor even lucifer matches, were then in use. The pumps stood by the side-walks, the corners were lighted by oil lamps, and the old market houses occupied the middle of the chief thoroughfare in your city. Indeed, the market places still adorn some of the less important streets.

In the year of Mr. Price's birth, every foreign coin, save the Spanish dollar, ceased to be a legal tender within our dominions. He was five years old when the mouth of the Columbia river was discovered by an American, Captain Gray, the same man who but two years earlier had been the first of our citizens to load an American ship with furs on our west coast, trade these in China for tea and bring his vessel back to Boston laden with this precious cargo. This event marked an era in our early commercial history. Mr. Price had heard our early troubles with France discussed in his home, and listened doubtless with a shudder to the details of Burr's atrocious conspiracy. He could remember the Napoleonic wars, and had heard the foolish protests of the Federal party against Jefferson's Louisiana purchase, which opened a magnificent domain for our growing population, and without which our national life would have been in continual jeopardy.

Those were primitive times, though not entirely simple or guileless. Party spirit ran high as now: there was as much crimination and recrimination, as much bribery, billingsgate and official corruption then as now. We look upon them as slow times because there were no railroad monopolies, no corners in grain, no great strikes and only signs of anything like the Wall street of today. Yet those times and those men were the forces which hastened our unprecedented material growth and cemented our national units into a larger, stronger and more productive whole. We may well say, too, that the subject of this sketch stood among the foremost of his contemporaries, for integrity, public spirit and far-sightedness. It is fairly a question whether this generation will leave as much to its credit, or whether we shall as well resist all tendencies toward national or social disintegration.

Of the successful men of this city a large proportion were country lads, many of them from the counties immediately adjacent. It is not improbable that much of Mr. Price's success came from the fact that his duties as a farmer's son had hardened his constitution and given him, along with great endurance, a great tenacity of purpose. There is nothing like regular duty, conscientiously done, to "crystallize vapory intentions." It is, then, to be regarded as a bit of good fortune that he was born in the country and early inured to toil. In one place he tells us, "In 1809, on my twelfth birthday, I reaped my dozen sheaves" [with a sickle].

Yet, with all this, farm life was not much to his liking, for he says he "was fond of reading and entered the counting-house to escape the farm." But the labor there had done its part. He was hardy, and "temperate in all things."

On May 15th, 1815, he entered the famous shipping-house of Thomas P. Cope. Previous to this, however, he had spent a year in the store and family of Mr. J. W. Townsend, in West Chester. This was a good preparation for his duties with the

Copes. He once stated to the writer that his fondness for reading had saved him many a temptation after he had left the farm.

This shipping-house was well known from its connection with the "Cope Liners," those justly celebrated packets between Philadelphia and Liverpool, which before the days of steam vessels were the pride of our city.

They were then the most important vessels which came to this port. In size they had but few superiors in either the American or foreign merchant service. Built as strong as iron and oak could make them, they well reflected the character of the house which owned them. But a few months since, one of these ancient liners (which is now engaged in the petroleum trade) appeared in the river and was tied up at her old Walnut street berth. Immediately she became the centre of attraction to those who could remember the part she had taken in making the commercial past of Philadelphia so glorious. Under Thomas P. Cope Mr. Price received a full mercantile education. Then he spent a year with J. C. Jones, Oakford & Co., to prepare especially for the China trade, for which he appears to have had a most intense longing. However, by the time he had become of age, that trade was so depressed that he felt justified in seeking a career in another field. Accordingly he became a student of law in the office of the Honorable John Sergeant. This change of plan was certainly as fortunate for Philadelphia as for Mr. Price. There is no question but that the time spent in acquiring the details of mercantile life was of great value to him in his subsequent career. John Sergeant could not help respecting a young man who had won the esteem of the Copes by his sobriety and persistent attention to duty, and the great lawyer became and continued to be a firm friend to his pupil. The field opened by the law afforded a wider career where his relations with his fellows were more intimate, and where, above all, he could, even as an attorney, often act as judge, thus greatly contributing to peace and justice in the conflicting claims between man and man.

On May 28th, 1822, Mr. Price was admitted to the bar. From this time forward his course in life was fixed. No shadow of doubt as to his vocation appeared. The people themselves seem to have made him a real estate lawyer, and no one in this city ever surpassed him in knowledge concerning its land titles. Probably very few ever equalled him. He was universally regarded as a safe adviser. What stronger testimony in his behalf could be given? It has been remarked, by one who knew him intimately at this period of his life, that his mental concentration and singleness of purpose became so intense that he seemed to have no time to think of anything but his profession, and that he wore the appearance of a man wholly engrossed by business. This, however, was from no loss of interest in others. When he was able to tear himself from the cares of an increasing practice, his sympathies were found to be warm. He loved and was loved by children. There is no truer index to a man's heart than this.

Mr. Price married Anna, the youngest child of James and Rebecca Embree, of West Bradford, Chester county, Pennsylvania. They lived together thirty-four years. His biographical sketch of her is most touching. It was written while his grief was yet fresh. Her loss was a great sorrow, following only too fast upon that which came with the death of his daughter Rebecca. He writes: "While her remains are yet with us, I take the pen briefly to perform towards her the duty I have endeavored to discharge toward our beloved, departed daughter. I say briefly, for such I know would be her wish. . . . . My busy retrospections must now be my only resource."

While with Thomas P. Cope, we are told, Mr. Price "familiarized himself with shipping and commercial law, and afterwards grappled with the harder law of real estate." It is well to give here a statement made by the late Judge Sharswood, on the occasion of that gentleman's retirement from the bench as Chief Justice of Pennsylvania: "Mr. Price has not been what we

would term a conveyancer, but in England he would have stood high in that rank which is adorned with the names of Booth and Butler, Fearne and Preston." Mr. Price was chairman of the committee appointed to examine Judge Sharswood for admission to the bar more than half a century before the following remarks were made. "His examination," says the Judge, "was a thorough one, for then, as now, everything, which it was his duty to do, was done well. I have no doubt I made a great many mistakes, but he was kind and considerate enough not to correct them." "I doubt if he could tell us, even by approximation, how many titles in this large city (which he has seen grow almost from a village to its present proportions) have passed under his cautious and scrutinizing eyes."

He had no desire either to appear in court, or to have his clients appear there. No man was ever more anxious than he that they should settle their differences in a quieter, less expensive way; and, above all, that justice should be the basis of such settlement. Indeed, it is hardly too much to say that, if a client were plainly in the wrong, Mr. Price would rather decline than undertake the case. This at once explains why he was so often consulted, and his advice so generally acted upon, in the difficulties growing out of the unfortunate division in the Society of Friends, which involved titles to properties that were often very valuable. One of the leading citizens of Chester county inserted a clause in his will that, if certain contingencies arose in the settlement of his estate, the case should be laid before Mr. Price, and his decision should be final. These facts are inserted here because they show, more plainly than any eulogistic platitudes could, what his real standing with the bar and the community was. They are simply the illustrations which come first to mind. The number could be multiplied greatly.

As late as the year 1843 it was quite clear that the State was not receiving from its citizens the amount in taxes which it should, and that the earlier apportionments to the city of Phila-

delphia and the counties of the Commonwealth were unfair. To remedy this, a revenue commission was appointed according to an act of Assembly which was passed April 29th, 1844, and entitled, "An Act to reduce the State debt and to incorporate the Pennsylvania Canal and Railroad Company." In all, there were twenty-one members. Of these Messrs. Eli K. Price, James S. Craft, Maxwell McCaslin, John Krause and Owen Jones were constituted a committee to prepare a final report, which was, after many difficulties and discouragements, completed and presented to Governor Shunk in March, 1848. The value of the work done will be best appreciated by remembering that the entire increase of the returned valuations, after the action of this board, over that fixed by the revenue commissioners in 1845 was $43,477,255.

The work of these commissioners was evidently of a most delicate nature. They were empowered to measure practically the depth of Pennsylvania's patriotism and public spirit. The soundings were over tender spots in human character and possessions. It is not to be expected that there was no dissatisfaction over the report. But it is doubtful if any similar document could have produced less. One sentence in the report shows that the commissioners were conscious of no dishonorable or dishonest acts. "This work of revision we have intended to perform in the spirit of moderation, and for the proof of its equal and temperate justice, we confidently refer to the testimony adduced and to the record of our proceedings."

At the date of the report it was estimated that Luzerne county, now one of the richest in the State, had of property, subject to a tax of three mills on the dollar, $354,868 less than Huntingdon county. The present enormous coal trade of the Luzerne region was not even dreamed of. In Sullivan county, adjoining Luzerne, the tax on watches amounted to but one dollar and a half, as against $5000 paid in this city at the same time. A wilderness covered vast portions of the State.

In 1851 Mr. Price published a brief article upon that memorial of the county commissioners which asked for a repeal of the laws exempting churches, graveyards, colleges, schools, asylums, hospitals and other charitable institutions from taxation. After showing that such a repeal was against the spirit of all previous legislation here, that it was antagonistic to the very spirit under which the Commonwealth was founded, he continued: "The public squares, amounting to $1,670,400, yield no revenue to pay taxes with, and are especially of incalculable advantage to the health and enjoyment of the people of our city and county. There is something better than mammon, and more available for security and human happiness, and therefore within the scope of the considerations that must govern the wise statesman and legislator. It will not be forgotten what is due to a consideration of a pledged legislative faith, to objects and enterprises intended for the public good, for a small sacrifice is better than that the public faith be broken."

This evoked a spirited reply; but, as Mr. Price was evidently in the right, he may be said to have won an easy victory.

We now approach the period of Mr. Price's greatest activity as a public-spirited citizen. Fifty-six years of age; for thirty-eight years a resident of Philadelphia; for thirty-one years a member of the bar engaged in the transfer of property and advising in matters requiring care, judgment and fidelity: we may fairly assume that he was well known by his fellow-citizens. Honors, clients and emoluments came now without his seeking. In 1853 Governor Bigler requested him to prepare a bill for an act entitled, "An Act relating to the sale and conveyance of real estate." Here I quote in full the details of this important measure as given elsewhere by one well qualified to state the case.

This is the preamble: "Whereas the general welfare requires that real estate should be freely alienable, and be made productive to the owners thereof; and, whereas, in matters which

the judiciary is competent to hear and decide, it is expedient that the courts should adjudicate them after a full hearing of all parties, rather than that they should be determined by special legislative acts upon an *ex parte* hearing." "The evils had been that real estate was extensively bound by trusts that made vacant ground and dilapidated buildings inalienable in title, which kept it out of the market and unproductive and unimprovable by the owners or purchasers, without a special act of Assembly, and in some instances such act would not avail. The courts for remedy were enabled to make decrees to sell, lease, mortgage, and convey on ground-rent, or to enable the trustees to build, and the reservation of rents and the purchase moneys were substituted, with security, for the land sold on the limitations of the original trusts. Thus the present generation got a better living without loss to the succeeding owners of the trust property; the dilapidations, like those that tell of long chancery suits in England, have disappeared; our city has been improved and beautified, and business accommodated; the public revenue by taxes is increased, and unfettered titles are carried into the world's commerce for the most profitable uses; purchasers holding titles already adjudicated are purged of legal questions. The Act has been in force since April 18th, 1853, and is popularly called the Price Act." "Its beneficence has been often judicially acknowledged."*

"In 1857 Mr. Price published his 'Law of the Limitation of Actions and of Liens against Real Estate.' In 1874 his treatise on 'The Act for the Sale of Real Estate' (containing 193 pages) appeared, as a reading thereon, embracing the reasons for and the decisions upon the Act."

The increase in population in and around what was originally Philadelphia, that is the two square miles contemplated by its

*The quotations which refer to the acts Mr. Price aided in having passed by our State Legislature are taken from the History of Chester County, by J. Smith Futhey and Gilbert Cope. They were compiled for that work "by Wm. E. Dubois, assisted by J. S. Price as to legal matters."

founder, had gradually brought in its train a host of evils, which in 1853 were felt by good citizens to be no longer endurable. The growth, prosperity, and even the safety of the city, to say nothing of its good name, appeared to be hopelessly compromised by its faulty organization. Without regard to political party, the friends of municipal reform, on the 30th day of July, nominated Mr. Price for the State Senate. He promptly replied, directing his letter to Stephen Colwell, chairman, and other conferees. It was a thoroughly characteristic letter, and contains much that is even more applicable to the present than to the past state of our political affairs. For example: "The exercise of the elective franchise has become almost valueless, since the citizens are under a compulsion to vote for those whom they do not approve, or not to vote at all." It was evident he had recognized that the machinery of our elections had practically placed the citizen voter where the constitution never contemplated that he should be placed, subservient to a party, or to parties, either or both of which might be good or bad, according to circumstances. It has become even plainer now than then, that the tendency of political organization is to bury the conscience of the individual beneath the crushing weight of what influential leaders consider expediency. There is no lesson so hard for a demagogue to learn as that what is morally reprehensible can never be politically justifiable or even safe for the party that advocates it. Such a truth is utterly beyond the comprehension, or acceptance, of one who, seeking only present good, can never take the view of a statesman anticipating the forces and results which may follow in the remoter future.

In a letter to his friend, the late Judge Haines, Mr. Price expresses his opinion very freely concerning methods used in pursuit of office. It bears the date of March 17th, 1854 (he was then a Senator). It deserves reproduction here:

"My Dear Sir:—Your letter of 16th Jan'y not being a business one, I laid it by for a leisure moment, and that moment I

have not yet found. I must now write to get rid of my self-reproach. I did not then appreciate so fully, as I now do, these words: 'How contemptible appear the tricks and contrivances of party to secure or retain power!' You spoke thus from much ampler opportunities of observation than I have had, but I have verified the truth of your exclamation. When I went to the Senate, it was with a resolution to do what I should be myself convinced was right; not, it is true, expecting many others to be so transcendental in their views. I have a large confidence, too, in the goodness of human nature, and yet hold to my faith; and look upon those, who lose character, with a considerable degree of charity, as the victims of ignorance or accidental associations. But what is to be thought of Whig leaders and the best that the Senate claims, who have, some of them, high integrity in their ordinary transactions and in their duty to the State, yielding their expressed convictions to win capital to their own party and perhaps to their own support as candidates for governor?"

In accepting the nomination for the State Senate, Mr. Price did so with the express understanding that he was to give no pledges which would forestall discussion, and that he was to do nothing to ensure his own election. The special reasons for this union of his fellow-citizens upon him were: first, to secure the consolidation of the city; second, to substitute a paid for a volunteer fire department; and third, to have legislation which would suppress, or at least hold in check, the intemperance against which so many of Philadelphia's best citizens were then engaged in an active crusade. Horace Binney had said to his son, "I should think your battle would be half won if you could place Mr. Price's name, with his consent, at the head of your ticket." The history of the consolidation of this city will be alluded to later. We have now to consider the action of Mr. Price in regard to the temperance cause.

After Mr. Price's election a Rev. Mr. Rood wrote to ask him

what he would attempt for the temperance cause, and what he thought he could accomplish. This called for a reply from Mr. Price of the same date (October 31st, 1853), in which he favored the passage of a bill to submit the question of prohibition to a vote of the people of the Commonwealth, and from the result to ascertain what legislation public opinion would sanction and support. He saw clearly enough that this was not what the extreme temperance people desired; but at the same time he recognized the folly of attempting to enforce a law which the people would not endorse. These are his words: "By taking care to be preceded by an authentic expression of public opinion we will act safely for a good cause, and more effectually promote the good of our fellow-citizens." "While you and your clerical brethren invoke the strong arm of the law and await its enactment, there is no occasion to cease your efforts to do good in the cause. You have in hand the work of persuasion, and conviction must still go on as the necessary preparative measure." "We have all our lives to do good, and we can do nothing better than to be always doing it; and what we leave unfinished, we will enjoin upon our children to finish." "I shall be *prepared to go for that which shall be most effective to suppress intemperance, that the people* can be persuaded and convinced to sustain."

Under date of January 30th, 1854, Mr. Rood wrote to Messrs. Price and Patterson, asking them to support the bill, "To prohibit the manufacture and sale of intoxicating drinks as a common beverage, and the sale of alcohol and ardent spirits, except to authorized agents for medicinal, mechanical and artistic purposes." It was desired that this should go into effect on March 1st, 1855, and be followed by an enactment authorizing a vote on its repeal by the people on the second Tuesday in September.

On February 8th, 1854, the Prohibitory Liquor Bill was in order at Harrisburg. When the eighth section, authorizing a warrant of search in case of a complaint of a violation of the law, was read, a motion was made to postpone. Mr. Price

then rose and said he was not willing that this motion should prevail, and continued, "But I have been educated in certain sturdy notions of the rights and liberties of the people, inherited from the common law of our ancestors, and embodied in our State Constitution. It is therein declared that among the inherent and indefeasible rights of all men is that 'of acquiring, possessing and protecting property,' and also, 'that the people shall be secure in their persons, houses, and possessions from unreasonable searches and seizures.' Both of these above provisions, bulwarks of our rights and liberties, are invaded by this bill—unnecessarily and unwisely invaded by it." This of course provoked the bitter hostility of extreme temperance men. The *North American and United States Gazette*, in commenting upon Mr. Price's conduct, said: "Still there is an intrepidity of disinterestedness in his course, which is as unusual as it is heroic, and which must challenge the respect and confidence even of those who differ with him." Farther on the same article said of this eighth section: "For the usual rule is reversed and the accused must prove his innocence instead of standing guiltless till proved otherwise." What wonder then that a man of Mr. Price's loyalty to law and individual rights refused his sanction to so atrocious a measure.

The "Temperance Committee," on February 16th, 1854, sent a letter to Mr. Price. They felt aggrieved at his action concerning the eighth section, and also at the suggestion that he preferred to support a modified and more stringent license law, rather than their prohibition bill. The committee also reminded Mr. Price that but for the efforts of the temperance party he would have failed of his election "by more than two thousand votes." Rather an intemperate suggestion one might well admit on remembering that in so far from seeking or desiring election he was more than indifferent about it, and only consented to abandon his more congenial duties because the public, without regard to party, requested it.

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Mr. Price's reply was written on the following day (February 17th, 1854). It was clear that he had "the courage of his convictions." He adhered absolutely to all that he had said and all that he had believed prior to his election, and closed with the "sincere hope that so much good feeling and zeal as I believe to actuate you may be made available in a tempered and practical result for the repression of intemperance." The letter should have been convincing as to his sincerity. Especially strong was one sentence in it: "When you nominated me, it is true you knew the 'antecedents' of my life, and when your committee entered my office, the first thing I told them was, that the only pledge I would give them was that which my life would afford."

On February 21st, "the intemperate resolutions of the extreme temperance men were adopted." The fact, however, that of fifteen Vice-Presidents named at the meeting, "it is believed not more than one or two were present, and six have no known residence among the constituency of Mr. Price," and that three wrote notes and one published a card that their names had been used without their knowledge or consent, should at once show how ill-judged and intemperate some of the proceedings had been. Mr. George H. Stuart's published card was a severe censure, which left these radical gentlemen in rather a sad plight before the public. The Philadelphia *Register*, of February 20th, summed up the whole thing in the statement that "Mr. Price has not changed, but a few of the temperance men have."

The friends of Mr. Price called a mass meeting on the evening of March 3d. The result was a triumphant vindication of his course by the most influential citizens of Philadelphia. The remarks of Mr. Frederic Fraley (may he long survive) were a heart-felt tribute to the courage and character of Mr. Price. The frequent applause which they elicited showed what entire confidence the community had in the Senator. In nothing did his character appear more admirable than in this unpleasant contest. He stood like a wall between extreme partisans and

the constitution, which protected and guaranteed equal rights to all men.

On April 6th and 7th, 1855, Mr. Price spoke in the Senate on the bill to restrain the sale of intoxicating liquors. It is to be observed that those who had so recently upbraided him for his supposed want of zeal in the temperance cause, were now humbled and disheartened by their failure to induce extreme legislation. Mr. Price ought to have more than redeemed himself in their eyes by his generous forgiveness of the past and by his earnest efforts to ensure the passage of a bill which would be constitutional and efficient.

Aside from the great interests which he was chosen to represent, Mr. Price was also active in other directions in the Senate. "He drafted and had passed the Act of 1855, relating to charitable corporations" (P. L. 328); "and also the Act of April 27th, 1855, barring estates tail" (P. L. 368).

His sympathies were always in the direction of humanity. No one can point to an act of his which tended to increase the burden of any honest toiler. The legislative Act of May 4th, 1855, "relating to certain duties and rights of husband and wife, and parents and children," was one which brought relief to many an aching heart. It "enabled the wife to become a *femme sole* trader; to own her own earnings and dispose of her property while living, and when dying, without his interference; and, if she died intestate, it enabled her next of kin to take it. If by drunkenness, profligacy, or other cause, he shall neglect or refuse to provide for his child or children, the mother shall have all the rights of the father and perform his duties; may place the children at employment and receive their earnings, or bind them to apprenticeship, without the interference of such a husband, in the same manner as the father now can do by law; but if the mother also be of unsuitable character, the court is to appoint a guardian of such children with like powers. A husband guilty of such conduct for a year preceding his wife's death for-

feits all right to her estate and also the right to appoint a testamentary guardian of his children" (P. L. 430; also History of Chester County, p. 698). This legislation in favor of humanity has well been said to be "an advance on the statute book of any civilized nation, and was necessary, as these protections were not covered by our Act of 1848, passed to secure to married women their own property."

In 1856 he "secured the passage of sections enabling a deserted or unsupported wife, or one divorced from bed and board, to protect her reputation by action of slander and libel, and to sue for her earnings and property, and to receipt for and give refunding bonds for legacies and shares of decedents' estates" (P. L. 315). He was the author and ardent advocate of an "Act for the greater security of title and more secure enjoyment of real estate." This became a law in 1856, and embraces so many important points that I quote in full what his son has said about it. It "cuts off all the exceptions to land limitations of twenty-one years after thirty years; requiring all ejectments for land and liens acquired by levies on real estate to be indexed, to give notice to purchasers and mortgagees; all trusts relating to land to be manifested by writing, except when they arise by implication; specific performance, etc., to be demanded within five years; wills duly proved to stand unless objected to within five years; surviving executors and administrators to exercise testamentary powers of sale; regulates subrogation to liens; and provides that, in partition, the highest bidder is to have the choice of shares (P. L. 532). He also drew up the Act of 1859, which requires action within a year after entry made on land to stop the running of the statute of limitations in favor of the possessor, and to bar the remainder after the tenant in tail is barred" (P. L. 603).

As a citizen his activity was always in a safe direction. To illustrate this, I quote again from his son. "He was also the author of many Acts of municipal legislation, passed with a

view to the health, comfort and security of the citizens of Philadelphia; among others, that no street or alley is ever to be laid out of a less width than twenty-five feet. If any house now standing on a street narrower than that shall be taken down, the owner, in rebuilding, must set it back to that regulation. Every new house shall have a curtilage of at least 144 square feet of open space. There must be a parapet wall of brick or stone between the roofs of all houses, extending through the cornices, to prevent the spread of fire. A Board of Building Inspectors was also created, to see that all buildings are safely erected, and in accordance with the strict requirements of law. A Board of Revision of Taxes was established, to compel equality of valuation for taxation, and to supervise all assessments of property. A Survey Department to lay out plans for streets, culverts, etc., was also created, to which was attached a registry bureau, in which must be registered every deed or conveyance of real estate before it can be recorded, with a plan of the premises conveyed, so that no property shall escape taxation. And if there be conflict of claim of title, it can be promptly known, as no careful conveyancer passes any title without a certificate of search. He also prepared most of the sections of the Park Act of 1868."*

How active and efficient his exertions in behalf of our Centennial Exhibition were is within the memory of most here tonight.

In 1852 Mr. Price published a memorial sketch of the lives of his parents. It appears that he was the sole author, though the name of his brother Philip also appears on the title page, and he helped to print and to circulate the book. Though in this volume Mr. Eli K. Price states that he was not then a member of the "Society of Friends," it is very certain that their moderate and just principles were the directing power of his life. This little book (pp. 192) is a most tender tribute to the memory of

* These quotations, also, come from the valuable "History of Chester County," to which allusion has already been made. It is among the very best works of its class that our county has yet produced.

his revered parents. Probably better than any of his published writings does it reveal the profound religious convictions of the author.

In 1864 he read before this Society a brief paper upon the family as an element of government. Some of the ideas expressed in it were worthy of Herbert Spencer, and indeed one may almost say were prophetic of Spencer's views. The argument is at once a noble tribute to woman as the guardian of the race, and also a reflection of the innate purity of his own soul.

Love for, and pride in, his ancestry were strongly marked features in Mr. Price's character. Accordingly it does not surprise us to see him taking a conspicuous place in the "Centennial Family Meeting" of the descendants of Philip and Rachel Price, held at the old homestead, in East Bradford, in 1864. Friend that he was, at heart, there was one sentence in the account of the event (which he subsequently published) that must be quoted here. Our long civil war was drawing to a close. The agony of suspense was well-nigh spent, for it was clear that it was merely a question of time until the flag of the Union should float triumphantly over the entire land. He writes: "And what have the children of Philip and Rachel Price to say for those of their descendants who have been, or who are, absent from their homes, because fighting the battles of their country? On such an occasion, when met to commemorate our parents, we must bring all of ourselves and all that belongs to us into a comparison with these high exemplars and note the disparities. We have to say that, though it has not reached our sense of duty to do as these brave youths of our blood have done, we love them not the less, as our parents would have loved them not the less, for having obeyed *their own sense of duty* when their government and country were stricken by traitor hands."

Bound in the same volume with the last two papers, I find "A Discourse upon the Trial by Jury." It was read May 1st, 1863, before this Society. It shows how profoundly its author, Mr.

Price, had studied the subject. It is more than probable that, not only all juries, but many judges might read it with advantage to themselves and to those on trial.

In July, 1866, he read before the Numismatic and Antiquarian Society of Philadelphia a brief commentary upon some important but now obscure allusions to Revolutionary times, to which he added a short notice of the Pemberton family, which he says was ancient in England before the settlement of Pennsylvania.

In 1872 his busy mind was exercised in another direction. This time, upon the phases of modern philosophy, especially such as were attaining a rank luxuriance under the stimulus of the then latest ideas upon evolution. His published criticisms show remarkable acuteness in detection of the weak points in the new hypothesis. The facts were many of them strange, the relations of the facts were almost wholly strange: at least they assumed more scientific form and were under a more scientific presentation than ever before. What wonder then that Mr. Price failed, as most others did, to take in the whole subject at the first draught. It is well known that neither Mr. Darwin nor Mr. Spencer comprehended all that their doctrines taught, or even dreamed how widely their conclusions would reach and apply. Evolution itself was slowly evolved out of the best thoughts of the world's scientific leaders. Its propositions were then few, and its corollaries hardly more numerous. Already it has created a literature of its own, is as sure as the theory of gravitation and not less far-reaching. No man accepted more fully than Mr. Price did, in his later years, the abstract idea of evolution. The only question in his mind was, how far can it be considered operative? Here he was judiciously slow in deciding, and it would have been better for science if others had imitated his prudence. The largest task of the next century will be the sifting out and rejecting from the body of science such fancies as have been mistaken for facts and taught accordingly. Mr. Price

intended to act, as a judge with conservative tendencies would do.

His paper on this subject, read March 1st, 1872, is one of intense common sense, with here and there passages, which are eloquent from earnest conviction. To the average thinking man his argument will always have great weight; for it is in sympathy with human longings which no philosophy can ever moderate or change.

Having himself been a most active participant in the measures which led to the consolidation of this city, Mr. Price was by unanimous vote of the Historical Society of Pennsylvania, on October 28th, 1872, requested to prepare "The History of the Consolidation of the City of Philadelphia." The dedication is to the venerable Horace Binney, and bears the date of December, 1872. It is a duodecimo of 140 pages. To give a clear idea of the increase in population around the original city, he investigates the early charters. The city, as contemplated by its founders, was to contain 1280 acres—exactly two square miles. The first city charter was not granted until October 25th, 1701, though its charter as a borough was about seventeen years older. On March 11th, 1789, a second city charter was obtained.

Step by step, *outside of the city proper*, the following districts were incorporated, and in the following order: Southwark, in 1762; Northern Liberties, in 1771; Moyamensing, in 1812; Spring Garden, in 1813; Kensington, in 1820; Penn, in 1844; Richmond, in 1847; West Philadelphia, in 1851; Belmont, in 1853.

It is enough to say that each district had its own police force, and that to escape arrest, for the time, it was simply necessary to step across an imaginary line from one district into another.

A meeting in behalf of consolidation of these disjointed members of the body politic into a compact city, whose government should be better and less expensive, and whose further expansion should be unlimited, was held on November 16th, 1849. It

was attended by more than eighty of our then leading citizens. Nothing had done so much to prepare the public for the contemplated change, as the mobs of 1844.

They supplied all fair-minded men with ample evidence that in city politics, party lines must be abandoned and concert of action effected on this vital question. There could be neither peace nor progress without it.

Added to those riots which sprang out of creed or color, were others more serious (because more frequent) which grew out of the volunteer fire system. In the spring of 1853, another meeting was called to consider the latter cause of trouble, and, if possible, to devise means for its suppression. It was a foregone conclusion, this need of consolidation. The only question was, on what basis should it be effected. To accomplish it, legislative action was requisite. Public sentiment settled upon Mr. Price as the man to represent this part of the city's interest in the State capital. He was not offered the office as an honor, for it was felt he would honor the office, but it was tendered as a sacrifice of inclination and of interest, which he must make for the public good. And as such he accepted the nomination for the office of State Senator. To say that for the mere honor of office, which so possesses some small minds, he cared nothing, is to make a very mild statement of the fact. In so far from spending time or money to gain a seat in our legislative halls, Mr. Price would have given freely to be allowed to remain a private citizen. His letter of acceptance, read by his friend, Mr. Joseph B. Townsend, before the nominating convention, is in all respects a remarkable one. The expressions, brief and sharp, in which he pointed out the dangers from what has since culminated in that greatest of political curses known as the *Boss System*, are now recognized as prophetic.

Mr. Price (as already stated) was elected "by independent voters who left their party attachment and discipline" in the interest of the greatest good of this city.

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We can go no further into details here, than to say in the words of the memorial presented to the State Senate on January 3d, 1854, that among other things, consolidation "dispenses with a multitude of treasurers, solicitors, clerks, superintendents, or their equivalents, besides a host of subordinates. It dispenses with 168 tax collectors, and will cause a saving in this one item alone of $100,000 per year."

Of course any bill which promised to make such sweeping reductions in the number of office-holders would be opposed by that disinterested fraternity; and at once the specious argument was advanced before its passage by the Lower House, that the consolidation would endanger the city trusts. It is creditable to the men of all parties in the city, and to their representatives at the State capital, that the argument was estimated at its true worth, and the bill passed by an almost unanimous vote.

The select committee of the Senators of the City and County of Philadelphia, of which Mr. Price was chairman, in its report to the Senate compressed the whole truth into the single statement that, "while nearly all the cities of our continent have been allowed freedom of expansion, and have bounded forward in population and wealth, the City of Philadelphia had fallen, in 1850, from the first to the second in wealth, and the fourth in population." There was no resisting such an argument.

It was a great day for Philadelphia when the Consolidation bill passed. One can hardly imagine how dark a day it would have been had the bill been rejected, or even essentially modified.

Mr. Price's friend and companion, the venerable and revered Frederic Fraley, had much to do with giving shape to the ideas of the sub-committee and committee appointed to prepare the bill for presentation to the Legislature. His large business capacity and intimate knowledge of the details of city government were freely offered in the public interest. He may well rejoice now in the beneficent results of his labor. It was a

master stroke which made the office of City Controller an elective one, in which the people decided who should oversee public expenditures. Maladministration thus lay largely at the doors of the voters. Did space permit, this portion of Mr. Price's useful life might well receive more extended notice.

In November, 1873, he published in some of our leading State papers eight brief articles, giving his objections to our proposed new State Constitution. It is needless to say that his points were well chosen and ably defended. After a lapse of thirteen years, some of the evils he then foresaw have proved gigantic enough to threaten our whole social fabric. It is proper that these objections be here briefly recorded.

The first was that, as compared with the rest of the State, Philadelphia was inadequately represented in our Legislature.

The second was, that it prescribed limits to the powers of the Legislature, stated rules to be observed, prohibited bribery and corruption, showed how even a clerical mistake might become a law (as it has done); but gave no method of enforcing right or punishing wrong in certain important contingencies.

The third showed that the election of judges was practically placed in the hands of a self-elected caucus.

The fourth was, that the proposed equality of taxation was not only a hardship in Philadelphia, but an express violation of assurances properly given prior to the passage of the Act of Consolidation, and also that the proposition to tax charitable and educational institutions and churches was in violation of traditional policy so old, and so often expressed, that it had become sacred as unwritten law, even if not actually on the statute books.

The fifth point was, that in apportionment of the State revenues under the proposed new Constitution, "no moneys of the State could be applied to any purpose of charity, education, or benevolence, or to develop our resources, or to gratify or instruct the people;" and that even after payment of the State debt these prohibitions would remain the same.

The sixth exception was mainly in regard to corporations. Mr. Price contended that justice had not been done them in the way of protection. On the other hand this Constitution left room for *unjust* discrimination, for cutting rates, for bribes in the way of free passes, and yet prescribed no penalty. It is probable Mr. Price recognized that even discrimination in freights might prove in one way a benefit to the masses, however hard it bore upon producers near the points where the products were consumed. It can hardly be supposed, however, that even he saw then the disastrous extent to which discrimination could be carried by our own corporations against our own citizens. Loyalty to his State, in him, reached the measure of devotion; and he would have spared no corporation that struck unjustly by discrimination at any legitimate business of his fellow-citizens.

The seventh objection was an echo of the first on the inadequate representation for Philadelphia.

The eighth, and last, objection concerned, mainly, the methods of administering justice in the city. The manner of electing magistrates placed the franchise practically in the hands of ward politicians. While the State was amply protected, "the citizens of no city have any protection from the evils of bribery, corruption and fraud." Though warned in advance of the needs of the cities, the constitutional convention "left us helpless of remedy, as before, and thus virtually deferred to and perpetuated the municipal rings, and permitted plunder to flourish."

These strictures were made before the new Constitution was voted upon by the people. Can any fair-minded man now deny how just they were, or how much needed? Mr. Price was warned by certain persons that he was acting to his own injury. His dignified defiance of all threats was simply characteristic of the man. The peaceful son of a peaceful sect, how often had he proved a very lion in the path of public plunderers. It is no exaggeration to say that he would have endured martyrdom for his principles. His appearance, conduct and mode of expres-

sion told plainly enough that he had a courage beyond intimidation. In pursuit of wrong-doers, he was simply merciless and unrelenting. Yet his admiration for industry and honesty were just as marked.

The Pennsylvania Colonization Society requested Mr. Price to prepare a biographical sketch of its former Vice-President, Dr. Edward F. Rivinus, who was also his personal friend. This sketch was an affectionate tribute to the memory of one who was an associate in a congenial cause.

Early in 1876 he prepared and read before this body a paper upon "The Glacial Epochs."

It is a review of the opinions held by the leading advocates of glacial action. How far time modified Mr. Price's objections to the hypothesis I have no means of knowing. It is certain, however, that he was more favorably inclined to it during his later years. The paper itself is a marvel of cross-questioning. Hardly any other than a legal mind could have produced it.

Prior to 1867 the question arose as to what were the legal uses of the so-called Penn Squares, which were in the older part of the city. Several citizens, who were joint-committee men of the Academy of Natural Sciences, the Library Company of Philadelphia, the American Philosophical Society, the Academy of the Fine Arts, and the Franklin Institute, asked Mr. Price's opinion upon the subject. This was subsequently published. It is well enough that the conclusions reached be given here; for they cannot be too well known, or too widely circulated among our citizens. Mr. Price held that the Central Square could and should, in justice to Penn's wishes and without any betrayal of public trust, be used as a building site for such educational institutions as were represented by the above committeemen; because these five Penn Squares were laid down by the first surveyor-general (Thomas Holmes), and it was specified, by implication, if not directly, in the "advertisement annexed to the List of First Purchasers," that, whereas the four others

were to be kept open, the central one was to have upon it "houses for public affairs—as a meeting house, assembly or State house, market house, school house, and several other buildings for public concerns." That pamphlet should least of all be forgotten by this Society, as it declares our legal status in times of either peace or war.

Prior to 1876 the legacy of André Francois Michaux became available to this Society. It is worthy of note that our honored chief in botany, Prof. Asa Gray, was present at the preparation of that will, and it is more than possible made suggestions which should be kindly esteemed here. This, however, is conjecture. Mr. Price was made chairman of the committee having in charge the execution of the Michaux trust. In 1876 he read his report here, showing that the income had been judiciously expended, and, almost as enthusiastically as if he had been half a century younger, he stated his plans and the hopes which grew out of the fund. It can hardly be said that this legacy from France started Mr. Price upon the agitation of the timber question and the necessity of a national and state system of forestry. His fondness for trees was an inherited one, and all his life he had been a tree-planter. For a score of years he had witnessed with sadness the wholesale destruction and waste of our forest growth. It was thus a happy chance which associated his name with that of Michaux. No man could have had a stronger or more practical leaning toward the execution of such a trust, and no man would have been more certain to see that the testator's wishes were religiously carried out.

I thus desire here to record the fact that of all those who, in this State, agitated the timber question before it had commended itself to the public judgment, the most efficient was *Eli Kirk Price*. He has had his share of sympathy for having gone so wide of the mark (it was thought by some) as to predict that there ever could be a dearth of timber in this land. Now that the whole country is awakening to a recognition of the truth of what he

taught, let him have the credit of a prophet and a public benefactor.

In this connection it is but just that I also mention the name of another Pennsylvanian, the Honorable Washington Townsend, who, when a member of Congress, was chairman of the Committee on Public Lands, which started the late Franklin Hough on his productive career as a compiler of forest law and literature for our national use.

It is a matter of regret that Mr. Price did not live to witness the observance of Arbor Day, when the school-children all over the State were engaged in planting the trees under whose shade future generations might rejoice. Those who see what the day has done in Nebraska will recognize something more than sentiment in its observance.

In November and December, 1877, Mr. Price read before the American Philosophical Society a paper on Sylviculture. This apparently was suggested by the duty of utilizing the income from the Michaux legacy. It is, however, important as being among the first studied papers upon that subject published in this city. Considering how much we were then in the dark, as to the precise facts and statistics of American forestry, it is a wonderfully clear statement of wants and remedies as applied to our own soil. A year later he supplemented it by a briefer one.

On March 20th, 1879, the Numismatic and Antiquarian Society of Philadelphia presented him, its President, with a silver medal in commemoration of the twenty-first anniversary of the foundation of that organization. Dr. Daniel G. Brinton, who has earned so distinguished a place in anthropological science, made the presentation address, after Mr. Henry Phillips, Jr., had delivered and explained the medal itself. On its obverse this medal bore the name and portrait of Mr. Price, and on the reverse were the seal and date of the foundation of the Society. Mr. Price made a brief and felicitous response.

Greatly as Mr. Price valued such a tribute of respect and

veneration, the moderation evinced in his reply was thoroughly characteristic.

His active interest in the Numismatic and Antiquarian Society appears in his contributions made from time to time.

On January 15th, 1884, the friends of Mr. James J. Barclay gathered at the Philadelphia House of Refuge to celebrate his ninetieth birthday. Mr. Price spoke effectively and affectionately on the occasion. Listening to what was said of Mr. Barclay, Mr. Price could hardly avoid recognizing that much of it was also applicable to himself. Age, fidelity, exemplary private life, recognition by the best citizens as Philadelphia's most respected men; came in equal measure to them both.

Of those who began life with Mr. Price, but few survive. Among them Dr. Ezra Michener stands pre-eminent as a public-spirited citizen and as a scientist. The tribute paid by this venerable gentleman to Mr. Price, who was once his room-mate and always his friend, is of the warmest character.

For many years Mr. Price was an active member of the Board of Trustees of the University of Pennsylvania. He gave no stinted measure of care and interest to that great institution, and more than once aided it from his own financial resources. It is not too much to say that his legal knowledge was of the greatest importance in the administration of its real estate. He was also President of the Preston Retreat, one of our noblest charitable institutions. He was also one of the original members of the Park Commission, and, as chairman of its committee on land damages and purchases, passed under his personal supervision all the titles to the large area now occupied by the people's pleasure ground, which aggregates in value nearly eight millions of dollars, this, too, without any charge whatever for his services.

In concluding what is here said of Mr. Price as a public character, it appears proper to quote from a letter written by him to a relative twenty years ago. There was no suspicion in his mind that any part of the letter would ever be published. Hence

a peculiar value attaches to the following extract as indicating his own real integrity of character.

"Having said so much, I am now going to offer thee some cautions; but these are also for thy encouragement. But whatever thee may do I wish to see it over thy own name, or initials, or none. In discussing sacred truths no unusual name should be assumed. For myself, I write nothing that I would not put my name or initials to; first because they give authenticity to what is written and help the effort that should be kept uppermost to tell the best truth we know in the best manner we can. The writing thus authenticated will have a greater weight with our contemporaries, and if read yet later will be our testimony, borne from one generation to the next. If we write with sincerity of purpose under a sense of duty, we need not be disturbed by the apprehension of criticism; for, if others can do better, let them try it, and for one I shall be thankful to them."

His love for this commonwealth was only exceeded by his love of truth. It would be difficult to write a history of this State or City without reference to the services which he has rendered directly or indirectly. No movement of public policy which he inaugurated or actively aided was other than a benefit to those in whose times he lived.

We can hardly tell when he began to grow old. The erect, commanding frame gradually became a little bent, and the vigorous step a little more slow; but up to the evening of November 14th, 1884, when he was in his eighty-eighth year, his mind was active and his interest in human affairs warm.

He lay down in usual health, and just before the dawn of November 15th, passed quietly to his eternal reward. He saw the sun rise out of a cloudless horizon from near the throne. Anticipating the change, he had written:

"I hear celestial billows roll,
Before I've reached the parting strand:
I listen with transported soul
To music from the better land."

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He had lived so simply, and cared for himself so systematically, that there was no real disease. The machinery of life quietly stopped when the full measure of work was done, and the world was left the poorer because a great, good man had gone.

Admirable as he was in his public relations, he was no less admirable in his family life. He carried to his home all the charm of a gentle, affectionate, thoughtful man.

The children of Mr. Price were:

I. Rebecca E., married to Hanson L. Withers.

II. John Sergeant.

III. Sibyl E., married to Starr H. Nicholls.

Of these, the son, an eminent lawyer of this city, alone survived him.

Whatever we may think of ourselves, the fact is, the example of such a man as the subject of this sketch may be studied with advantage by all. There was not in his early life anything which placed him in a conspicuous light before the world. He entered upon his career with simply honest ancestry and personal rectitude and good health to favor him. Yet without self-seeking, without fawning to powerful patronage, without sacrifice of self-respect, without ceasing to condemn wrong, he became one of the most conspicuous men in this city, which claims a population of a million inhabitants. Why was it?

I. Because his fidelity to trust was absolutely unassailable. No man ever lived in whom this was stronger. A trust was as sacred to him and as binding upon him as though the exact case had been specified in the volume of revelation.

II. Because, when called upon to express an opinion, he did so from his honest conviction, without the slightest regard to what friend or foe might think of it; and his actions were always as positive as his opinions. But with all this, he was singularly tolerant of the honest opinions of others.

III. Because he was usually in advance of his times, and often

very far in advance. It is only requisite here to specify his relations to the park, to the timber, colonization and abolition questions in illustration of the above statement.

IV. Because he held to the plan of work which he had laid out for himself with undeviating steadiness through a long, active life.

These may be called modest qualifications with which to win the universal esteem in which Mr. Price was held. True, yet it appears they were sufficient. He was not a great genius, nor a man of destiny, but he was something better than either—an honest worker. His intuitions never did duty instead of his convictions, for the latter maintained their supremacy throughout, and were only trusted when fully weighed. This explains why during so long a life Mr. Price was seldom obliged to reverse an opinion once formed.

His virtues were of the Spartan kind. The style of literature may change from century to century. The science of to-day may be rejected as insufficient in the next score of years. Habits of thought, dress, social usage, all these are ephemeral; but simple, perennial honesty can never become antiquated. The more corrupt a nation may become, the more will it be needed, and the longer will it be respected. A life moulded by conscience and warmed by love can never be other than a benefaction to those living under its influence. It is not claimed that the subject of this sketch was perfect. What mortal can be? Nor was he without enemies. High integrity and moral convictions must always clash with less noble elements. But with all this, no better advice can be given to those who follow than to be as much like him as possible. Eli Kirk Price may well be taken as an ideal worthy of imitation.

*Obituary notice of Dr. Albert H. Smith, by Dr. Harrison Allen.*

*(Read before the American Philosophical Society, Dec. 3, 1886.)*

Albert Holmes Smith was born in Philadelphia, July 19th, 1835. He was the seventh child of Dr. Moses B. and Rachel D. Smith. His ancestors emigrated from England about 1685, soon after the grant by Charles II to William Penn. Dr. Moses B. Smith was a noted practitioner of medicine at Bustleton, Pa., from 1814 to 1829. From the date last named to that of his death he was well known in Philadelphia as a practicing physician. He died in 1855 in the sixty-eighth year of his age. He was a man who stood high in the estimation of his fellow-citizens. He was an associate of Physick, the elder Hartshorne, J. K. Mitchell, and other eminent medical men. He was one of the founders of the American Medical Association.

The education of Albert H. Smith was conducted in accordance with the views of the Society of Friends. After passing through the Academy at Westown and the private schools of James Lippincott and Henry D. Gregory, he entered the Collegiate Department of the University of Pennsylvania, whence he graduated with honor in 1853. Immediately after graduation he matriculated in the Medical Department of the same institution, and obtained his diploma in 1856. He was fortunate in receiving the position of resident physician at the Friends' Asylum for the Insane at Frankford, and subsequently the more important office of resident physician to the Pennsylvania Hospital. He was thus in every way thoroughly prepared for the duties of practice which soon devolved upon him. At an early period of his career he became identified with the Nurses' Home and Lying-in Charity. He served as one of its physicians and lecturers for the long period of twenty years. This unassuming charity is a centre from which has always emanated authoritative teaching on the subject of obstetrics. Hundreds of physicians scattered over the face of our wide country have received their instruction in this all-important branch of medical art from Dr. Smith. The Nurses' Home was the scene of much of Dr. Smith's professional labors. He here laid the foundation of that career which in many respects was remarkable.

For a short time Dr. Smith was one of the obstetricians to the Philadelphia Hospital, and in 1868 he became one of the consulting physicians to the Woman's Hospital. Dr. Smith was twice elected president of the Philadelphia Obstetrical Society, and of the Philadelphia County Medical Society. He presided over the American Gynecological Association at its eighth annual meeting. He visited Europe in 1880, when he was received with distinction by the leading physicians both in England and on the continent. In 1885 he was elected an honorary member of the Gynecological Society of Great Britain.

Dr. Smith enjoyed robust health until the fall of 1883, when the symptoms of an incurable malady announced themselves. With but slight abatement the disease advanced until it compelled its victim to seek abso-

lute repose. After a prolonged illness, accompanied with great suffering, he died, December 14th, 1885.

Dr. Smith married Miss Emily Kaighn, daughter of Charles Kaighn, of Kaighn's Point, N. J. He was the father of seven children, five of whom survive him.

To attain to a commanding position in a difficult art, to become a popular practitioner in a city where professional competition is keen, demands qualities of unusual order. By steady, untiring persistence Dr. Smith conquered a position of eminence among his brethren and a place in the hearts of hosts of patients. In the last mentioned relation his rank among the physicians of Philadelphia was, perhaps, unique.

Dr. Smith was *facile princeps* the leading obstetrician of his time in America. He developed a skill in the management of cases requiring instrumental aid which in the opinion of his colleagues has probably never been exceled. In the language of an associate: "He held advanced positions both as a practitioner and a teacher of obstetrics. He used the forceps with unsurpassed skill."

The excessive toil which is inseparable from the life of an obstetrician in full practice—the irregular hours, the exacting vigils—demand an iron constitution and a determined will. Dr. Smith possessed these qualifications. In common with many men of exceptional endowment, he enjoyed the faculty of sleeping at times which did not interfere with the exactments of long-continued toil. Forty-eight hours have been passed without sleep on his part and yet without impairment either of physical or mental vigor. Nothing ever came to him as an interruption. The demands of the most unreasonable patient never annoyed him. When at his prime he was indifferent to fatigue and hardship. I recall on one occasion meeting him at the house of a patient when the cold was extreme, and the streets were all but impassable from the accumulations of ice and snow, congratulating myself that I was free from the labor which was before him that day. Yet he failed to comprehend that anything unusual existed, and did not appear to regard in the slightest degree conditions which are generally held to be distasteful and simply to be endured.

It has been frequently observed that men of the cast of mind of Dr. Smith are rarely literary in their inclinations. The lives of intense responsibility lead by them; the fatigue to which they are habitually committed; the weariness and disposition to repose which is so well known to follow upon long periods of exposure to the open air, no doubt suffice to explain this disinclination. It is a noteworthy circumstance that in spite of this disinclination Dr. Smith was a literary worker. Soon after leaving the Pennsylvania Hospital he is found editing "Ellis' Formulary," a work requiring great patience and care. He contributed a number of papers—eighteen in all—to the medical journals. As an evidence of the cast of Dr. Smith's mind it may be noted that of this

number ten were on practical subjects. In the main they were in illustration of improvements of instruments and of apparatus. An important modification by himself of a uterine pessary is favorably known over the entire medical world. He was the first to introduce into practice the intra-uterine applications of hot water in arresting hemorrhage. At a time when his practice was at the largest he undertook the study of the German language, and at a later period he enjoyed an easy command of the medical literature of Germany. As a writer Dr. Smith was clear and forcible. In a sketch of Dr. Emeline H. Cleveland he attained a truly eloquent strain. This fact is worthy of mention since he was always self-depreciatory of his literary abilities and disclaimed every intention to authorship. He was often heard to regret that with him the act of composition was difficult.

These are the chief facts, as the world esteems facts, in the life of Albert H. Smith. Much remains to be said, much that at my hands I keenly feel must remain imperfectly said. The elements of character which made Dr. Smith while he was among us an honored object, remain now that he is dead an undying memory.

Dr. Smith was a man of chivalrous type, and his life was consecrated in the best sense of the term to the service of the Highest. It was more to him to right a wrong and to defend the weak than to make scientific discoveries. The impression made upon his mind from being brought in contact with disease was the suffering that appealed to him for relief rather than the nature or the results of morbid processes. As a consequence he is found less active in the investigation of the anatomy and the pathology of those diseases with the study of which he was identified than with the means of assuaging the pain and distress attending their presence in the economy. He was not heard to express any exalted conception of the duties of the physician; he made no pretension to any special consecration to good works; he was, indeed, too busy a man to systematically attend to the rites of a society so simple in organization as is that of the Friends. The attitude assumed by him toward the suffering was not that of one who from generous impulse was occasionally induced to offer relief, but as one impelled by an incentive which was constantly present. It actuated the performance of the smallest duty as well as the greatest, and was the same in the dwellings of the rich as in those of the poor.

Many instances are told in which Dr. Smith undertook the task of seeking out the helpless and rescuing the fallen. Dr. Christopher Cleborne, of the U. S. Navy, is my authority for the following incident: Dr. Smith, while a resident at the Pennsylvania Hospital, had in some way learned that a poor country girl had been enticed from her home into a brothel. She was sick, in debt, and unable in consequence to escape from her surroundings. Finding that she was penitent, he opened a correspondence with her friends, paid her indebtedness, enabled her to get away from the den in which she was lodged, and to be restored to her parents. On another occasion Dr. Smith was called upon by an agent for a be-

nevolent society who informed him that an abandoned woman was about to be tried for the murder of her child. The poor creature had taken the life of the infant soon after its birth. She had been arrested and at the time that Dr. Smith was notified she was on trial for the crime. It appears that the mother had applied to the Nurses' Home for assistance, but in vain. Dr. Smith needed but a simple narration of the facts to have his sympathies aroused. He relinquished all his engagements and repairing to the court-room undertook to defend the woman. He endeavored to show by statements made on the witness-stand by himself and his medical friends, whom he had summoned, that a homicidal tendency is not infrequently developed in the mother while in the parturient state, that the woman had sought relief and protection at the Nurses' Home, which, had it been granted, would have shielded her from her own maniacal disposition, and that no premeditation to the murder could be proved. The plea was successful and the woman was acquitted.

The zeal which always characterized Dr. Smith's efforts to save and defend women doubtless accounted for the line of practice he accepted. While a resident at the Pennsylvania Hospital he was noted for the delicacy with which he treated the women patients. In his practice he gave evidence of a thorough acquaintance with the peculiar organization of women. He studied not only her physical but her psychical nature. Women returned this appreciation with an esteem and affection that was unbounded.

A lady whose knowledge of Dr. Smith was gained almost entirely in the course of his professional visits to herself, has recorded some of the impressions which she derived from him. His influence, she thought, was due in great part to his sympathy. It had no limits. He took the trials and griefs of others to himself. He was never known to be impatient even when he was weary and sad at heart. As his health failed he disguised his sufferings and listened with interest to the most trifling ailments. "I saw him," said she, "on the very day that he finally gave up work, yet he was so bright and cheerful that I felt completely reassured that he was restored to health."

Dr. Smith had a high conception of womanhood. He accepted woman as man's help-mate in the most exalted sense. He held her to be man's guide and controller. In his judgment, while her moral instincts were truer than his, her mental powers were equal, and that on the encouragement given her depended the moral regeneration of the world. He was as urgent in calling her to a true sense of the immense importance of her mission as he was strenuous in his endeavors that society at large should acknowledge her claims. "Woman," said he on the occasion of a memorial meeting held in honor of Professor Cleveland, "must expect to exalt herself to her true position in which she can perform the proper function in the intellectual and social economy."*

* Papers read at the Memorial Hour in Commemoration of the late Professor Emeline H. Cleveland, M.D., Phila., 1879, p. 28.

From the foregoing it can be easily understood that Dr. Smith became an early and consistent advocate of the medical education of women. He urged upon the profession and the community the justice of admitting women to the practice of medicine, and to all the privileges of membership in the representative medical bodies. To use the words of an eulogist,* "he bent his broad shoulders to shield professional women from roughness and unjust depreciation, and to remove from their path the stumbling block of scornful indifference." He was undaunted by opposition and unwavering in his adherence to his convictions. That ostracism followed such a course mattered not; that he was openly assailed as a man who was defiant of public opinion did not move him. Defeats of women candidates to election to membership in the Philadelphia County Medical Society did not deter him from repeatedly renewing the attempt.

At a meeting of the Pennsylvania State Medical Society, held in Pittsburgh, in May, 1878, Dr. Hiram Corson presented a resolution to the effect that every Hospital for the Insane in the State be administered by two medical attendants, one a man and the other a woman. The resolution met with great opposition, and at the ensuing meeting at Chester it was actively discussed. In the course of the debate Dr. Smith spoke stoutly in favor of the resolution, and throughout the struggle which agitated the society defended the position taken by Dr. Corson. The resolution was lost by a close vote of 40 to 35.

Dr. Smith lived to see the opposition to the medical advancement of women in great part overcome and to enjoy the gratitude of those whose cause he had so valiantly espoused. When the warning of failing health compelled him to relinquish his practice and to seek relief abroad, he was the recipient of the most touching expressions of regard from the physicians and the students of the Woman's Hospital. On the occasion of his death a meeting of the Alumni of the Woman's Medical College was called and largely responded to. Messages of sympathy were received from graduates from distant cities. In commemoration of his self-appointed service in their behalf and the interests which they represented, a portrait in oil was ordered to be painted and presented to the Hospital. In pursuance of this intent a portrait now adorns the parlor of this institution.

The prolonged illness of Dr. Smith called out as much sympathy from his friends and patients as he had extended to others. It may be here related that when it was found desirable to remove him from his city residence to his cottage at Beach Haven, the equipment of the city ambulance service became available and the interest taken by the mayor of the city, by the police surgeon, Dr. Morris Stroud French, and by the police corps in seeing that the beloved physician was painlessly and expeditely taken from his sick-room to the cars—the streets being cleared for the purpose—made the occasion in a degree a public one.

His attitude to children was all but reverential. It was beautiful to see

* Public Ledger, Dec. 15, 1886.

his countenance lighten up even in midst of pain to hear of the welfare of some little friend. Tokens of affection showered themselves upon him during his illness. A lady narrates the incident that a fortnight before he died she took her little niece, of whom he was extremely fond, to see him. He gave her some flowers, and, though suffering greatly at the time, insisted upon carefully fastening them to her dress himself.

Such is the brief chronicle of an important life. Not that much has been left in literature or science in evidence of what he accomplished. In the best sense of the term his career was imperfectly developed. He was at the point of attaining a position in life where many converging lines were meeting. A fairly lengthened span would doubtless have given opportunity for complete application of his powers. It is well known that he was on the threshold of a preferment which would have greatly increased his influence and widened and strengthened his position, when the last summons came with no uncertain sound. The spear fell from his nerveless grasp and the fight was over.

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*Stated Meeting, December 3, 1886.*

Present, 13 members.

President, Mr. FRALEY, in the Chair.

Professor F. A. Genth, Jr., a lately elected member, was presented to the Chair and took his seat.

Correspondence was submitted as follows, viz: A letter of envoy with request for exchange from R. Istituto di Studi Superiori practici e di perfezionamento in Firenze, Italy; a letter of envoy from the Foreign Office at the Hague; a letter announcing change of address from Dr. F. L. Otto Roehrig, Los Angeles, Cal.

On motion, the R. Istituto di Studi Superiori was placed on the Society's exchange list, to receive from No. 121.

College of Physicians (Philadelphia) requested the loan of portraits belonging to the Society, of such persons as were founders or fellows, to be shown at its approaching Centennial exhibition, December 28, 1886–January 6, 1887. The application was on motion referred to Curators with instructions to report thereon at the next meeting of the Society.

Accessions to the Library were received from the Depart-

ment of Mines, Melbourne; Comité Géologique, Académie Impériale des Sciences, St. Petersburg; Imperial Society of Friends of Natural Sciences, Anthropology and Ethnology, Société Impériale des Naturalistes, Moscow; Society of Naturalists of New Russia, Odessa; Mr. Emile Schwœrer, Colmar, Alsace; Foreign Office at the Hague; R. Istituto di Studi Supériori, Biblioteca Nazionale Centrale V. E., Firenze; R. Accademia dei Lincei, Rome; Ecole des Mines, Société de L'Enseignement Superieur, Muséum d'Histoire Naturelle, Paris; Sociedade de Geographia de Lisboa; R. Meteorological Society, Zoölogical Society, "Nature," Mr. John Hampden, London; Essex Institute, Salem; Rhode Island Historical Society, Providence; Professor John S. Newberry, New York; The Buffalo Library; Engineers' Club, Franklin Institute, Henry Phillips, Jr., Philadelphia; Bureau of Education, The Public Opinion Co., Washington; University of California, Berkeley; Observatorio Astronomico Nacional de Tacubaya, Mexico; Imperial Observatorio do Rio de Janeiro.

A photograph of Mr. Carlier, of Paris, was received for the Society's Album.

Dr. Harrison Allen read, by appointment, an obituary notice of the late Dr. Albert H. Smith. The decease of Charles Francis Adams (Boston, Nov. 21, æt. 80) was announced, and after remarks by Messrs. Dudley and McKean on the services rendered to the United States by him during the Civil War, the President was authorized, on motion, to appoint a proper person to prepare the usual obituary notice.

The Committee on Publication reported that as the paper offered for the Transactions, November 5, by Professor Cope, had already appeared in a magazine for November its publication by the Society was not desirable, and that it should be returned to the writer. Which, on motion, was so ordered.

Nominations 1113–1150 were read.

The proceedings of the Officers and Council, of which the reading was postponed at the last meeting, were submitted.

The Treasurer's Report was presented.

And the Society was adjourned by the President.

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him the communication, description, or model, except the officer to whom it shall be entrusted; nor shall such officer part with the same out of his custody, without a special order of the Society for that purpose.

6. The Society, having previously referred the several communications from candidates for the premium, then depending, to the consideration of the twelve counsellors and other officers of the Society, and having received their report thereon, shall, at one of their stated meetings in the month of December, annually, after the expiration of this current year (of the time and place, together with the particular occasion of which meeting due notice shall be previously given, by public advertisement) proceed to final adjudication of the said premium; and, after due consideration had, a vote shall first be taken on this question, viz.: Whether any of the communications then under inspection be worthy of the proposed premium? If this question be determined in the negative, the whole business shall be deferred till another year; but if in the affirmative, the Society shall proceed to determine by ballot, given by the members at large, the discovery, invention or improvement most useful and worthy; and that discovery, invention, or improvement which shall be found to have a majority of concurring votes in its favor shall be successful; and then, and not till then, the sealed letter accompanying the crowned performance shall be opened, and the name of the author announced as the person entitled to the said premium.

7. No member of the Society who is a candidate for the premium then depending, or who hath not previously declared to the Society, that he has considered and weighed, according to the best of his judgment, the comparative merits of the several claims then under consideration, shall sit in judgment, or give his vote in awarding the said premium.

8. A full account of the crowned subject shall be published by the Society, as soon as may be after the adjudication, either in a separate publication, or in the next succeeding volume of their Transactions, or in both.

9. The unsuccessful performances shall remain under consideration, and their authors be considered as candidates for the premium for five years next succeeding the time of their presentment; except such performances as their authors may, in the meantime, think fit to withdraw. And the Society shall annually publish an abstract of the titles, object, or subject matter of the communications, so under consideration; such only excepted as the Society shall think not worthy of public notice.

10. The letters containing the names of authors whose performances shall be rejected, or which shall be found unsuccessful after a trial of five years, shall be burnt before the Society, without breaking the seals.

11. In case there should be a failure, in any year, of any communication worthy of the proposed premium, there will then be two premiums to be awarded the next year. But no accumulation of premiums

shall entitle the author to more than one premium for any one discovery, invention or improvement.

12. The premium shall consist of an oval plate of solid standard gold of the value of ten guineas. On one side thereof shall be neatly engraved a short Latin motto suited to the occasion, together with the words: "The Premium of John Hyacinth de Magellan, of London, established in the year 1786;" and on the other side of the plate shall be engraved these words: "Awarded by the A. P. S. for the discovery of——A.D.——." And the seal of the Society shall be annexed to the medal by a ribbon passing through a small hole at the lower edge thereof.

SECTION 2. The Magellanic fund of two hundred guineas shall be considered as ten hundred and fifty dollars, and shall be invested separately from the other funds belonging to or under the care of the Society, and a separate and distinct account of it shall be kept by the treasurer.

The said fund shall be credited with the sum of one hundred dollars, to represent the two premiums for which the Society is now liable.

The treasurer shall credit the said fund with the interest received on the investment thereof, and, if any surplus of said interest shall remain after providing for the premiums which may then be demandable, said surplus shall be used by the Society for making publication of the terms of the said premium, and for such purposes as may be authorized by its charter and laws.

The treasurer shall, at the first stated meeting of the Society in the month of December annually, make a report of the state of said fund and of the investment thereof.

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☞ It is requested that the receipt of this number be acknowledged.

☞ Members who have not as yet sent their photographs for the Society's album will confer a favor by so doing.

☞ Please communicate any change of address or inaccuracy in name.

☞ In order to secure prompt attention it is requested that all correspondence be addressed simply "To the Secretaries of the American Philosophical Society, 104 S. Fifth St., Philadelphia."

☞ A few sets of the Society's Transactions, New Series, 1818 to 1888, XVI vols., 4to, can be obtained from the Librarian. Price, $80.00.